THE

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Editorials.

STATE AID FOR VETERINARY EDUCATION.

At last, as may be seen by the abstract in our columns from the report of the meeting of the Royal Agricultural Society, some little pecuniary recognition has been granted to Veterinary Education in the shape of the sum of £800 from the Treasury for the year 1906-7, to the Royal Veterinary College; the grant being conditional upon the requirements of the University of London being met by the College, and in order that this institution might be placed in the position of a recognised School of the University. Small as the amount is, we must look upon it as an augury of the fact that the Government has at length decided to officially acknowledge the benefit derived by the country from veterinary teaching, and look forward to the time when the British Veterinary Colleges will at least be as well off in this respect as the magnificently equipped and State-supported schools of our Continental *confrères*.

The part most difficult to understand is why in this, one of the foremost agricultural and stock-raising countries of the world, the Government have not been the first to extend a helping hand. The good work done by veterinary surgeons and the necessity for their efficient training is everywhere acknowledged by those whose lives are spent amongst animals, but how seldom does that acknowledgment take a practical and pecuniary shape; how rare it is to read of a munificent bequest left to any of the veterinary schools! Ger-

many, France, Belgium, Austria, Hungary, and even the smaller countries of Denmark, Switzerland, and Roumania, all have magnificently equipped and State-aided veterinary schools, which can vie in their laboratorieswith those of the finest hospitals, whilst Great Britain, the richest, most powerful, and most animal-loving country of them all, is fully fifty years behind in this respect. To those who have travelled and seen the Continental veterinary schools and the advantages possessed by those who work there, it is wonderful that veterinary science in this country has been able, under such disadvantageous conditions as those under which it exists, to attain the position it has.

It is a matter for sincere hope that the grant will never be withdrawn, but that, on the contrary, it will annually be increased until all the veterinary schools of England, Scotland and Ireland are able to obtain the necessary buildings and equipment which they so urgently need, and which lend assistance so efficiently and so very materially to scientific research into the causes and prevention of disease both amongst animals and man.

OUR PROFESSIONAL EXAMINATION SYSTEM.

FOR some time past there has been a feeling amongst those who take an interest in medical education that the curriculum, both of the medical and the veterinary student, and also the present system of examination, might be improved upon, and some suggestions in the report of a recent meeting of the General Medical Council and in the article by Syntax, found in a column of this month's issue, are worth consideration. Both the medical and the veterinary student find that the time allotted for the whole course is none too long; or rather, to put it in another way, that it is very difficult, in fact almost a matter of cramming, to properly study each of the numerous subjects which comprise the prescribed course in the allotted time.

Cramming, as every one will admit, neither does good to the student at the time, nor does it lead to the permanent acquisition of knowledge for the future; whilst it neither increases the powers

of observation nor teaches a man to reason things out for himself. The sole and only object it has in view is to pass the examination, and there is no doubt that to those who systematically cram for examination their sphere of knowledge terminates at this point.

The veterinary or medical practitioner, to be successful, must always be a student, and the knowledge acquired at College is merely a foundation on which to build subsequently; any system which compels steady work throughout a constant period must of necessity be better than one which allows the student an idle time at the commencement, but yet which enables him to cram sufficiently at the finish to pass examinations, the majority of the knowledge being forgotten as soon as this end is attained.

The suggestion made by Syntax is that the examination should be spread over the entire period of study, and not compressed into a few minutes at the end of the course, and there is no doubt that this would certainly tend to promote greater and more regular industry on the part of those concerned, instead of "the all too prevalent practice of slacking through the greater part of the session, combined with a feverish and totally unhealthy cramming during the week immediately preceding the examination." The term examinations are to be held by an "internal" examiner—viz., the teacher in the subject concerned—and, at the final test, the services of an "external" examiner shall also be requisitioned, the combination of the two ensuring as wide and broad a view as possible to be taken of the subject and the curriculum. If such a scheme could be arranged, there is no doubt that it would tend to increase the amount of steady work done throughout the term by the student, and, from a commercial aspect, a point to be considered when the finances of the ruling body are not very flourishing, it would almost halve the expenses of the examination at once, not on account of the amount actually paid for examination fees, but on account of the cost of travelling.

There is much to be said from other points of view, the subject is well worth further consideration and discussion, and we invite the attention of correspondents to the question.

EDUCATION AND EXAMINATIONS.

BY SYNTAX.

It may be asserted, without fear of contradiction, that matters educational are, at the present time, in a state of unstable equilibrium such as has not been surpassed at any bygone period. From the numerous communications which appear almost daily in the various periodicals devoted to education, it is abundantly evident that authorities are by no means satisfied with the methods at present most commonly followed. The fact that education is vastly different from the mere acquisition of knowledge is becoming more and more insistent, and the almost universal desire is that methods should be so altered that education may become more what the word indicates—a drawing out and a cultivation of the faculties of observation and reasoning. In other words, the mind should be trained, and its powers strengthened; and it should not be crammed with a heterogeneous accumulation of disconnected facts incapable of assimilation and frequently provocative of intellectual indigestion.

In connection with schools and colleges where students are prepared for the liberal professions, so-called, it frequently appears that the object of those who plan the curriculum is to foster methods of cramming, to the detriment, if not exclusion, of those of education. The true object of a curriculum in science, for example, is not the instillation into the brain of the student of the maximum number of facts in a given time; but the training of the mind by the imparting, by lectures or otherwise, of such reasoned and associated truths as shall illustrate general principles and cultivate the faculty of right seeing and the drawing of sound conclusions from observed phenomena. It is not of prime importance that a student should leave his college with a brain teeming with all sorts of detailed knowedge; but it is of essential moment that he shall take with him some increment to his capacity for seeing and judging. In short, unless the teacher has put the student on the right road to learn for himself, that is, unless the teacher has taught the student to teach himself, either the course of instruction has been wrong, or the student has not been a fit subject for education. If the course of instruction is wrong, then either the teacher is inefficient or he is handicapped in some way by prescription.

That there are students who leave a class almost totally devoid of true education is well known to teachers of any experience. And these students are not necessarily those who are considered by their fellows to be below the average in intelligence. Indeed, they may have taken a high—sometimes the highest—position in their classes and examinations. Such are almost invariably purely "book-men," and are almost entirely incapable of seeing for themselves. It is hardly necessary to say that, once they have left the class-room, their education—save the mark—is at an end. They are incapable of pursuing that best of all education—self-education; and it is hardly a matter for wonder that they do not take a very prominent position in their world. That a system of education which produces such men and allows them to take class positions above that of others, and in reality far better men, is wrong, must be admitted.

To obtain the best possible educational result it is scarcely necessary to say that much depends upon the teacher. But, even given

the right teacher, the best results may not emerge if a rigid curriculum of study is demanded by a third party. It may be accepted as an axiom that no two teachers are alike, nor any two students. This being admitted, it is clear that a rigid system—however good in theory—will not produce the best educational results. The teacher must be allowed to adopt such method of imparting instruction as experience has taught him is the most productive of fruitful results, and this method he must be permitted to modify according to the varied needs of his individual students.

Furthermore, if a proper function of a scientific institution consists not only in assisting the dissemination of fully approved knowledge, but also in increasing the sum of knowledge,* it follows that teachers should be investigators,† and that they should be free to impart their discoveries, however great or however small, to their students. In this way the enthusiasm of the teacher is augmented, and is productive of a like enthusiasm in the student.

If it were possible to make the members of a class also investigators it would be an enormous gain to true education. Of course, it is not for a moment suggested that every student should be set to do research work in the ordinary acceptance of the term. But every student might, so far as possible, be expected to employ research methods in his class work, and so be led to cultivate his powers of observation and reasoning. Such an idea is not by any means new; nor is it as unworkable as at first glance appears. In the Report of the Moseley Commission, appointed to investigate American educational methods, we read: "In every way the student is taught to consider that he himself is undertaking a research, that he is rediscovering for himself what others have found out before him. In accordance with this view no slovenly work is allowed . . . with the result . . . that in a very short time it becomes a habit in each man to perform every experiment with real care and thoroughness." If care and thoroughness are thus cultivated, has there not been real education? And does it greatly matter if the student forgets, after a time, the actual facts he has learned? The training will stand him in greater and worthier stead in his after self-education than would any number of facts crammed into his already over-laden brain by a lecturer.

One reverts to the point that the fundamental importance of a scientific curriculum is the teaching of a student to teach himself; or, as has been aptly said recently, the training of the mind in the assimilation and application of the facts met with in every-day life. The prime question should be: Has the student been really trained? And not: How many facts has he remembered?

The greatest possible stumbling block to the application of an elastic and rational curriculum is a fixed and rigid syllabus drawn up

* Sir William Ramsay has recently said that, "the *chief* function of a university is to increase knowledge." (The italics are not in the original report of the Address [Address delivered at University College, London].) The remark is not confined in its application to universities.

† In some universities—the University of Chicago, for example—the various members of the teaching staff are required to devote one-half of their time to research. That this is a commendable condition, is shown by the great additions Chicago has made to scientific knowledge within a comparatively few years (*vide* the *Decennial Publications*).

by a body of men in which teachers and educational experts are represented by a small minority. Under such a system, the teacher is compelled to follow a certain line of instruction irrespective of his own or his students' individual requirements. The evil is all the more aggravated when, at the end of the course or session, an examination has to be passed in which the teacher has no voice. The subject of external examiners has been very ably treated within the last few months by Professor Windle, of Cork,* an authority of much experience both as teacher and as examiner, who points out that, when students know that they will be examined by someone not their teacher, they naturally regard their class instruction as a waste of time should it pass for a moment beyond the immediate requirements of the examination. "Hence," says Professor Windle, "arises neglect of the teacher's instruction, coupled, quite possibly, with contempt for him and actual irritation at his teaching." That there are students who will not so treat any excursion that the teacher may make, goes without saying. But it is also true that such men are comparatively few in number in any given class.

If it were possible to abolish examinations entirely it would be a distinct gain to education. That this is not possible is clear, and especially so in the training for professions. The public must be made to feel that professional men have had a training of some sort. Therefore examinations must remain with us. But the evil of examinations —and it is admittedly an evil, if a necessary one—should be reduced as far as possible. One way to do this would be to spread the examination over the entire period of study, and not compress it into a few minutes at the end of the course. This, at least, would ensure constant work on the part of the student, and would prevent the all too prevalent practice of "slacking" through the greater part of the session, combined with a feverish and wholly unhealthy cramming during the weeks immediately preceding the examination. It would, further, afford a much better test of the candidate's fitness to proceed to the next stage in his studies.

This leads to the main point. Is the curriculum as laid down by the Royal College of Veterinary Surgeons the best that could be devised for the production of well-trained professional men? And are the examinations, as at present conducted, incapable of improvement?

Concerning the answer to the first question, opinion probably—and naturally—will be divided. It would be somewhat difficult, if not impossible, for a single person to lay his finger on all the weak points in the scheme which the various teaching institutions are compelled to follow. Teachers of particular subjects no doubt hold views not entirely in accord, and it would require a consensus of opinion to arrive at serviceable conclusions. But to take one single subject by way of example, it is surely a great mistake to divorce the consideration of the bones and joints from that of the other organs of the body. Anatomy should most certainly be taught and examined upon as one subject, and not as two. No doubt in theory it is a very excellent plan to lay the foundation of anatomical science during the student's first year, and during the second year to erect a superstructure upon this

* "Examinations in Ireland and the University Question." *The University Review.* Vol. ii., No. 7. November, 1905.

foundation. In practice the results are not so excellent. Students are human, and, when they have passed the regulation examination on bones and joints, are exceedingly apt to consider that they have finished with these inconvenient barriers to their progress. It is with some difficulty that they are persuaded that bones and joints form a part of the work of the second year of study as well as of the first.

With a very little manipulation of the existing syllabus, it could be arranged that anatomy remain one whole, and not dismembered, subject spread over two sessions. If it be considered that an examination be necessary at the end of the first year as well as at the end of the second—a point upon which there may be two opinions—there is no reason why an examination on elementary anatomy should not be held at the end of the first year, and one on advanced anatomy at the end of the second year.

Furthermore, a knowledge of true practical anatomy might reasonably be required in, at least, the second examination. By this is meant that the student might be required to show that he had performed his class-dissections properly by being expected to dissect out particular structures at the time of the examination. It would be understood, of course, that such a dissection be done in the anatomical and not in the surgical manner.

Concerning the question of examinations and the methods of conducting them, it may be well in the first place to summarise the various examination systems at present in vogue. They fall naturally into three groups: (1) Where the examiners are external, *i.e.*, where the examiners are not teachers of the candidates under examination. (2) Where the teacher examines his own students, and is not subject to any check by an external examiner. And (3) where the teacher of the candidates is associated with an external examiner who is a specialist in the particular subject of examination.

It is hoped that the objections to the first method have already been made clear. The second method is better than the first, and is that commonly followed on the Continent and in America. It is, however, not free from objections. In the first place, it may be contended that the teacher is too much biassed to form an ideal and disinterested examiner of his own students. This objection, while carrying a certain amount of weight, will be recognised as a gratuitous insult to the teacher. A much more valid objection is that students, knowing that their teacher is to be their only examiner, may be inclined to attend too exclusively to the one set of views to which prominence has been given in the work of the class, to the neglect of other views of possibly equal or even greater value, which have not been so strongly advocated. Though it is good that the teacher should exert great influence over his students, it is not good that their minds should become one sided.

Most of those who have devoted an adequate amount of thought to the matter, and who have carefully weighed the advantages and disadvantages of the various methods of examination, will agree that it is in the best interests of the student that he should be examined by his teacher in conjunction with an external examiner occupied in the same branch of science. By such a method the teacher is allowed free scope for the carrying out of his own particular scheme of instruction, and, consequently, his teaching gains in interest to himself as well as to the

student. Attendance upon an unhampered course of study is more inspiring to the student, and more likely to produce good educational results.

The presence of an external examiner is to be commended for two reasons at least. In the first place, a check is placed upon the possibility of a teacher riding some particular hobby, or nurturing some particular view to the exclusion of all others. In the second place, the presence of an external examiner insures that the standard of examination is not allowed to fall.

To make this method of examination approach more nearly to the ideal, the work of the student during the whole course of the session should be taken into account. This, of course, can only be done by an internal examiner who will note carefully the results of class-examinations, the work in the practical classes, and the general fitness of the student for the pursuit of a professional career. As has been previously stated, in this way a much clearer idea could be gained of the condition of the candidate's knowledge than is possible under the present system of compression.

In propounding the scheme of examination by an internal and an external examiner, no new method is being suggested ; for the plan obtains, and has obtained long enough to test its efficiency, in English and Scottish Universities. That such a method is practicable in veterinary examinations is obvious. At the present moment there are five veterinary institutions in the United Kingdom, *i.e.*, there are five teachers available on each subject. It does not appear to be impossible, therefore, to make arrangements by which the teacher of the candidate should be assisted by another teacher of the same subject A commercial point much in favour of the plan is the relief of the Royal College of Veterinary Surgeons of a considerable proportion of the expense attached to the present system of examinations. At least the travelling expenses of one examiner would be saved, and it is possible that a further saving might be effected if the various teachers were to consent to examine their own students without fee. I, of course, have no warrant for assuming that teachers would so act, but there seems no reason why the possibility, at least, of their so doing should not be considered.

The main points contained in the above may be summarised as follows: The object of education is the *training* of the mind, and this can best be done when the teacher is not hampered by a too rigid syllabus. Examinations, since they cannot be abolished, should, if possible, be diffused over the entire course of study, and are best conducted by the teacher of the candidates in association with an external examiner who is a specialist in the subject of examination. Naturally the prescription of the subjects of examination, and the length of the course of study in each subject, would be left, as at present, in the hands of a central controlling body.

THE GENERAL MEDICAL COUNCIL.*

THE customary two sessions of the General Medical Council took place during the year and proved very interesting, although they were shorter than usual and remarkably quiet. The Council seems of late to be more sure of what matters do and do not lie within its scope, and in this way many idle debates have been avoided. The members met for the summer session on May 23, and concluded their deliberations on May 27. Dr. Donald MacAlister, who took his seat for the first time as President of the Council in succession to Sir William Turner, was able to inaugurate his official duties by making a very satisfactory pecuniary statement. At the end of 1903 the total deficit of the Council was over £2,000, but by the end of 1904 this debt had been reduced to a little over £200, the greatly improved position being attributable not to any increase of ordinary income, but to greater economy of expenditure. The medical profession has been glad to learn the excellent results that can follow orderly administration, for it has been generally felt that it is not only undignified but unsafe for the General Medical Council to be out at elbows. There should never be any suspicion that the politics of the Council have been influenced by a desire to replenish an empty pocket.

At the summer meeting a report of the Education Committee of the Council was submitted by Professor Bertram C. A. Windle upon the possibility of educating the medical student in subjects upon which he would afterwards not be examined. The report was a negative document, but it led to a useful debate upon some of the problems now presented by the curriculum of the medical student. It is well known to all teachers attached to medical schools that the present state of the medical curriculum, despite all the care and forethought that have been exercised in arranging it, offers grave defaults. To begin with, it is overloaded, and this is perhaps the root of all its evils. As a consequence of this overloading there are too many examinations, and the element of chance that is thus introduced presses unfairly upon some of the most promising students. Whereas the statutory period of the curriculum is five years, the average time taken by the medical student to obtain a place upon the Register is over six years, a fact which implies much serious expense on the part of parents and guardians, and much bitter disappointment on the part of unlucky examinees. In the meantime medicine progresses, therapeutical developments abound, and the number of facts which have to be acquired by the medical student increases, so that the difficulty of lightening the curriculum grows greater and greater. The fifth year of study, which was to have been spent by the student, according to the design of the General Medical Council when lengthening the curriculum from four to five years, purely in clinical work, is now largely taken up in the attempt to absorb the contents of text-books, and there is no opportunity for the adequate application at the bedside of the theoretical knowledge acquired in the class-room and laboratory. The report of the Education Committee did not say any of this, being properly confined to its terms of reference, and we do not say that all of it has been admitted by the General Medical

* Abstract from a report published in the *Lancet*, December 30, 1905.

Council, but very many members of the Council appear to feel that this is a substantially accurate picture. The report elicited the fact that we are alone among the nations in not confiding the examination of our medical students to those who have instructed them. Everyone can see at once that the scope of the curriculum becomes practically limited if teacher and examiner are the same person, and in those places where this does occur in our country the examination becomes easier to pass. What has been taught constitutes the schedule for examination, and a vast amount of elementary reading and fruitless committal of text-books to heart is avoided. Still, the plan has its obvious drawbacks, for standardisation of the medical education of the country as a whole becomes impossible to secure. An interesting debate followed the submittal of the report, with the result that the question was again remitted to a committee, this time to a committee of the whole Council, with instructions to prepare a detailed report upon the systems of examination in medicine followed in other countries. We welcome the business-like way in which the Council recognised that the problems of medical education are becoming extremely difficult of solution. We are not in the habit of urging, whenever anything goes wrong in this country, that continental methods should be imitated, but we feel that the position of our medical students is an extremely trying one, and that the Council is making sensible attempts to deal with it.

ABSTRACT FROM THE REPORT OF THE MEETING OF THE ROYAL AGRICULTURAL SOCIETY OF ENGLAND (JANUARY 10, 1906).

Veterinary.

The Earl of Northbrook (Chairman) presented the following report by Sir John McFadyean:—

Anthrax.—During the last four weeks for which the returns have been issued (week ended December 30) 78 outbreaks, with 103 animals attacked, were reported. This makes a total of 967 outbreaks and 1,333 animals attacked during the past year, as against 1,023 outbreaks and 1,533 animals attacked in 1904.

Glanders.—During the same four weeks the outbreaks numbered 84, and the animals attacked 133. The total outbreaks during the past year were 1,209, with 2,062 animals attacked; while the corresponding figures for the previous year were 1,507 and 2,628 respectively.

Swine Fever.—During the same four weeks 77 outbreaks were reported. This was 29 more than during the corresponding period of 1904, but the total outbreaks for 1905 numbered 817, as against 1,188 in 1904.

Sheep-scab.—During the same four weeks the reported outbreaks numbered 117, bringing the total for the year up to 919, or 448 fewer than in 1904.

With reference to the reply of the Board of Agriculture to the deputation from the Society on December 6, 1905, a letter had been received from Sir Thomas Elliott, dated December 15, 1905, intimating that the Treasury had decided to make a grant of £800 to the Royal Veterinary College for the year 1906-7. At the request of the Committee, Sir John McFadyean had explained that this Treasury grant of £800 had been made to the Royal Veterinary College in order that it might be placed in the position of a recognised School of the University of London, and that the grant was conditional upon the requirements of the University of London being met by the College. These requirements involved an increase of staff and an increase in the building accommodation; so that no portion of the grant would be available for the provision of the veterinary privileges hitherto accorded to the members of the Royal Agricultural Society in return for the Society's annual grant. The Committee had arrived at the conclusion that it was essential that the veterinary privileges hitherto accorded to members should be continued; and they resolved to recommend to the Council that a grant of £200 be made to the Royal Veterinary College for the year 1906, upon the understanding that the College would afford the same privileges to the governors and members of the Royal Agricultural Society as heretofore.

Lord Northbrook, in presenting this report, said that it made absolutely clear the position of the Society with regard to the grant given by the Treasury to the Royal Veterinary College. That grant was given for special higher veterinary education, and was ear-marked for that purpose. Not one penny of that sum of money could go to the relief of work done by the Royal Veterinary College for this Society. The Committee had had, therefore, to consider the question as if that grant had never been made. They had come to the conclusion that it would be very unfortunate if they had to discontinue the work done through the Royal Veterinary College. That work had been of great benefit to the members of this Society, and to farmers, stock-owners, and breeders throughout the whole country. The Society's grant was the only money that was available for this purpose, and if it was discontinued the work would have to cease, and the veterinary privileges of their governors and members would have to come to an end. He hoped, therefore, that the Council would continue the grant, and he begged to move the adoption of the report, and also a formal resolution that a grant of £200 be given to the Royal Veterinary College for the present year on the same conditions as before.

Mr. Reynard seconded, and the motion was formally adopted, Mr. Adeane explaining, in reply to a question by Sir Charles Knightley, that the grant involved no increase on last year's expenditure.

(*Live Stock Journal.*)

THE TARPAN AND ITS RELATIONSHIP WITH WILD AND DOMESTIC HORSES.*

BY J. C. EWART, M.D., F.R.S., REGIUS PROFESSOR OF NATURAL HISTORY UNIVERSITY OF EDINBURGH.

In December, 1902, I communicated to the Society a preliminary note "On a New Horse from the Western Islands,"† and six months later submitted the results of experiments made with a view to ascertaining whether Prejvalsky's horse is a true wild species, or, as suggested by Flower and others, a chance hybrid between a kyang and an escaped Mongol pony.

The new horse (now commonly known as the Celtic pony) described in the first paper is characterised by a small head, large prominent eyes, short ears, and narrow nostrils; by a long tail, mane, and forelock, and, during winter, by a thick, light yellow-dun woolly undercoat and a remarkable tail-lock (Plate II., 7); by having, like Prejvalsky's horse, only twenty-three dorso-lumbar vertebræ, and also by the complete absence of callosities from the inner aspect of the hocks and from the region of the fetlocks—*i.e.*, by the absence of the hind warts or chestnuts, and of the four ergots invariably present in typical specimens of the common horse. In speed and staying power, intelligence and docility, the Celtic pony takes after high-caste, fine-tempered Arabs.

This new horse I provisionally named *Equus caballus celticus*; but as it—apart from its coat—more profoundly differs from the common horse than either asses or zebras, it will probably be eventually regarded as a true species. The results of the experiments with the wild Asiatic ass submitted in the second paper,‡ made it sufficiently evident that Prejvalsky's horse is not a hybrid between a kyang (*E. hemionus*) and a Mongol or other Eastern pony. Further observations have made it equally evident that while some of the horses found running wild amongst the Great Altai Mountains may count strayed domestic horses amongst their recent ancestors, the majority of them probably have an unbroken chain of true wild ancestors.

The existence in North-Western Europe of the Arab-like Celtic pony and in Central Asia of the long-headed Prejvalsky's horse—forms quite distinct from the *Equus caballus* of Linnæus, Gray, and other systematists—led me to feel less certain of the view provisionally adopted, well-nigh half a century ago, by Darwin, that all the existing races had descended "from a single dun-coloured more or less striped primitive stock."§

The discovery, two years ago, in a remote part of the Western Highlands of Scotland of the remnant of a variety or species adapted for a forest life, made it impossible any longer to entertain the view that domestic breeds had all descended from a single post-glacial species.

The conclusions arrived at during 1903 were in due time published in a paper entitled "The Multiple Origin of Horses and Ponies."‖ In

* Reprinted, by permission, from the *Proceedings of the Royal Society of Edinburgh*, vol. xxvi., 1905-6.

† *Nature*, vol. lxvii., p. 239, 1903.

‡ *Proc. Royal Soc., Edin.*, 1903, pp. 460-8.

§ "Animals and Plants under Domestication," vol. i., page 65, 1875.

‖ *Trans. Highland and Agri. Soc., Scotland*, vol. xvi., 1904.

this paper I enumerated the chief characteristics of Prejvalsky's horse and the Celtic pony, and indicated in what respects these types differed from the forest variety,* which, because it presents all the points of the common horse of Europe, I designated the *E. caballus typicus*. I also in this paper mentioned that I regarded the Celtic pony as a member of a variety "which at a very remote period branched off from the main stem, and possibly reached Europe and North Africa long before the advent of the Neoliths—to become the progenitors, not only of accidental, but also of African races,"† and I added that, apart from its coat, mane, and tail, it is almost identical with the smaller kinds of Arabs. While in this country an effort has been made to prove that the domesticated horses have had a multiple origin, the conclusion has been arrived at in the United States that several species of horses flourished in America at or about the beginning of the Glacial epoch. In a recent address Professor Osborn states: "It was formerly believed, for example, that the modern horse had a single line of ancestors extending back into the Eocene period; now it appears that in North America there were always four to six entirely different varieties of the horse family living contemporaneously, including slow-moving forest-living horses with broader feet, and very swift plains-living horses with narrow feet fashioned more like the deer."‡

So much progress has been made during recent years in working out the origin and history of domesticated horses, that the time has now come when enquiries may be profitably pursued along certain definite lines.

In the first place (assuming that horses have had a multiple origin), enquiries should be instituted with a view to ascertaining as far as possible the characteristics of the post-glacial species and varieties

* In a tropical forest horse (Plate III. 9) the coat is of a dark yellow, dun colour, decorated by a broad dorsal band, remnants of stripes on the face, neck, shoulders, body, and loins, spots over the hind quarters and bars across the legs to a short distance below the knees and hocks, beyond which the legs are black; the mane, forelock, and tail heavy, consisting of long dark coarse wavy hair—the tail having no tail-lock; the hind as well as the front chestnuts large, prominent, and generally oval in form, and the fetlock callosities long and often curved; the hoofs broad, rounded in front, and wide behind; the head massive, but well proportioned, the forehead broad, with ridges extending from the prominent orbits towards the occipital crest, the profile convex from below the eyes to the level of the nostrils; the upper lip long and prehensile, and the lower lip thick, and often seen projecting beyond the upper; the ears wide, of medium length, and usually carried upright; the neck short and thick; the shoulders straight, ending in broad flat withers; the back hollow and long, owing to the presence of twenty-four dorso-lumbar vertebræ (eighteen dorsal and six lumbar); the hind quarters rounded so as to form a semi-circle between the croup and the feebly-developed second thigh, with the tail inserted near the centre of the half circle; the limbs short and strong, with thick fetlock and knee-joints, the forelegs tied in at the elbow and back at the knee, the hind limbs straight, and the hocks during action kept well apart. This horse is specially adapted for living in or near forests, for frequenting narrow paths, feeding on coarse grasses, leaves, twigs, and roots, and at need readily crossing swamps and clearing obstacles—by having prominent eyes, large teeth set in powerful jaws, and broad hoofs, and by having a conformation eminently suitable for leaping, and sufficient speed to enable it in times of danger to rapidly take cover in scrub or forest. The forest horse, though a clever leaper, has no great speed, but given time and sufficient food, it can undertake long journeys. Though often timid and spiritless, he is intelligent and docile, moves well, and is capable of carrying heavy burdens.

† *Trans. Highland Soc.*, 1904, p. 259.

‡ *Science*, N.S., vol. xxi., February 24, 1905.

which have taken part in forming the present domestic races and breeds; in the next place, enquiries should be instituted with a view to ascertaining to which of the lower Pleistocene species the more immediate ancestors of the living horses are most intimately related; and in the third place, an attempt should be made to determine from which of the ancestral forms the various domesticated breeds have inherited their more striking characters, *i.e.*, to ascertain to which ancestral types the Shire, Clydesdale, Percheron, and other heavy breeds, the Arab, Thoroughbred, Kattiawar, and other slender-limbed breeds, are indebted for their chief peculiarities.

In this paper I shall not attempt to show that either Prejvalsky's horse, the Celtic pony, or the Libyan variety recently described by Professor Ridgeway* is genetically related to pre-glacial species, or entitled to be regarded as an ancestor of one or more domestic breeds.

Sufficient data for a discussion of this kind is not yet available. I propose now, by way of clearing the ground for the investigations mentioned above, to enquire whether the Tarpan (long regarded as the wild progenitor of the common horse of Europe) deserves a place amongst the ancestors of living races and breeds.

Up to a certain period the only horses in Europe were wild horses; but in course of time the horse was domesticated and utilised for various purposes, and, as one area after another was settled, the districts suitable for herds of wild horses became gradually circumscribed, with the result that except in the wild wastes of the Gobi Desert and in the vicinity of the Great Altai Mountains true wild horses no longer exist.

Where, and by whom, horses were first domesticated will probably never be known; but this much is certain, that in Europe, and doubtless also in Asia, tame horses from time to time ran wild, either to join wild herds or to give rise to feral herds, such as were once common in America.

Had all domestic breeds sprung from a single wild ancestor, the individuals which ran wild would have been rapidly reabsorbed without in any way modifying the original wild stock—as tame rabbits are rapidly reabsorbed by the common wild rabbit. If, however, the escaped individuals had sprung from several perfectly distinct species, the result would be that, in addition to pure wild herds, one might have come across herds having a distinct infusion of tame blood, and also herds consisting of the mixed offspring of several domesticated breeds.

The multiple origin of the domesticated breeds being assumed, it follows that, in the case of the Tarpan herds, once numerous in the east of Europe, it is necessary to enquire whether they consisted of a wild species, were the offspring of escaped domestic breeds, or were crosses between domestic and wild varieties.

The first account of the Tarpan† we owe to Gmelin, who came across a troop near Bobrowsk during his journey through Russia, between 1733 and 1743. He describes them as mouse-coloured,

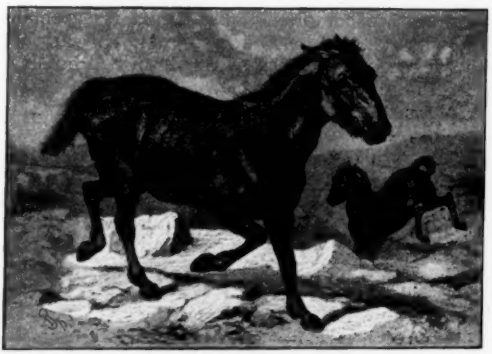
* "Origin and Influence of the Thoroughbred Horse," Cambridge, 1905.

† By the Tarpan I mean the mouse-dun horse of Russian and other Continental naturalists, not the so-called "true" Tarpan of Hamilton Smith (*Naturalists' Library*, vol. xii., 1841).

with a short, crisp main; the tail always shorter than in domestic horses, sometimes full, sometimes only furnished with short hair; the legs dark from the knees and hocks to the hoofs; and the head thick, with the ears sometimes long, sometimes short.

Since this description appeared, some Continental naturalists have regarded the Tarpan as a true wild species; others, like Dr. Nehring, considered it the last srvivour of the ancient prehistoric horses of Europe, modified by an infusion of domestic blood; while not a few agreed with Pallas that the Tarpan herds might very well be the offspring of escaped domestic horses.

English naturalists have, as a rule, adopted the view of Pallas. Sir William Fowler regarded the Tarpans of the Steppe country, north of the Sea of Azov, as the nearest approach to true wild horses, while Lydekker is inclined to believe that the Tarpan of Pallas might very well be the ancestral form of the common horse, *E. caballus*.* Beddard, in support of this view, pointed out that in its



The Tarpan from Vogt and Specht's "Natural History of Animals." This, like Hamilton Smith's drawing, has the mane and tail of a young foal. In no adult horse, wild or tame, is the tail as short as in the conventional drawings of the Tarpan found in modern, as well as old, works on natural history.

general build and appearance the Tarpan is highly suggestive of the wild horses sketched by primitive man upon ivory.†

Notwithstanding all that has been written on the subject since Gmelin's time, hippologists agree with Salensky, that the relationship of the Tarpan with wild and domestic horses has not yet been cleared up.‡

During the nineteenth century very little was done towards determining the systemic position of the Tarpan; in fact, since the Tarpan was first described, the statements of one writer (for reasons which will appear later) have often contradicted those of another. But in 1866 a Tarpan foal was captured in the Zagradoffe Steppe, on the property of Prince Katschubei, and reared by a domestic mare.

* *Nature*, vol. lxv., p. 103.

† Beddard's "Mammalia," p. 241.

‡ The chief papers on the Tarpan are mentioned in Salensky, "Monograph on Prejvalsky's horse," St. Petersberg, 1902.

When about eighteen years old this specimen was sent to the Moscow Zoological Garden, and eventually described in a paper published by Schatiloff.

This, like Gmelin's specimen, had a somewhat coarse head, was of a mouse colour, with legs black below the knees and hocks. The mane, however, instead of being short and crisp, as in Gmelin's specimen, was 48 cm. (over 18 inches) in length, and hanging to one side of the neck. Unfortunately the description of the tail of the Moscow specimen is somewhat meagre; but as a full mane is invariably accompanied by a forelock and a full tail in the Equidæ, it may be safely assumed that the tail resembled that of the common horse.

As clearly realised some years ago by Gray of the British Museum, certain vestigial structures, known as callosities, warts, or chestnuts, are of considerable taxonomic value. Warts or chestnuts, as already mentioned, are present on both the fore and hind limbs of the common horse, and they also occur on the hind as well as the fore limbs of Prejvalsky's horse; while in the Celtic pony, as in asses and zebras, the hind chestnuts are completely absent. It is especially worthy of note that though the hind chestnuts were not invariably present in Tarpans (they were absent in a Tarpan described by Krymsch), they were present in the Moscow specimen.

It thus appears that the Moscow Tarpan agreed in its colour with the specimens referred to by Gmelin and Pallas, but differed in the mane and tail, in both of which, as in its callosities, it resembled the common horse, *E. caballus*. Two Tarpan skeletons have been preserved—one in the Museum of the Universlty of Moscow, the other in the Museum of the Academy of Sciences, St. Petersburg. The chief point of interest about these skeletons is, that as in the kyang and Prejvalsky's horse and in certain Arabs, there are only five lumbar vertebræ.

In having only five lumbar vertebræ these Tarpans differed from the common horse of Europe, at least from the forest variety *E. caballus typicus*, in which I have invariably found eighteen pairs of ribs and six lumbar vertebræ.

From this striking difference in the skeleton, it follows that, even should the Tarpan turn out to be a true wild species, it cannot be regarded as the sole ancestor of the common horse of Europe.

As to the skull of the Moscow skeleton, Czerski came to the conclusion that it has, on the one hand, all the characteristics of Oriental horses, while on the other it approaches the Scottish breed to which belongs the pony; in other words, the skull of the Tarpan preserved in the Moscow Museum resembles that of the Celtic pony, and its near relative the Libyan horse.

The skull of the Tarpan in the St. Petersburg Museum, as Salensky points out, resembles skulls of immature specimens of *E. prejvalskii*, but the bones of the limbs and limb girdles are decidedly more slender, and have less pronounced muscular ridges than in the wild horse of Central Asia.

It may here be mentioned that for over a century all the horses living in a wild state in Europe, which happened to be of a mouse-dun colour, seem to have been regarded as Tarpans. If these wild horses were the offspring of several varieties, it will not be difficult to

account for the remarkable difference in the characters between the Tarpan of Gmelin and Pallas, and the Tarpan of the Moscow Zoological Garden. It is hardly necessary to point out that were we to find in one and the same herd adult horses with an erect or semi-erect mane and a short bushy tail, and others with a long flowing mane and a full tail, long enough to reach the ground, we should hesitate, even if they happened to be of the same colour, to regard them as intimately related; and if in addition some of them retained, while others had completely lost, the hind chestnuts, we should unhesitatingly look upon them as belonging to two different varieties, if not different species. Such differences, coupled with a want of agreement in the number of the lumbar vertebræ or in the ribs, would make in favour of adopting the view that the herd in question consisted of the feral descendants of domesticated horses, or had resulted from the intercrossing of a true wild horse with members of one or more domesticated varieties.

Seeing that herds of mouse-dun wild horses no longer occur in Europe, and have not during recent years been met with in even the most remote parts of Central Asia, it might perhaps be assumed that the Tarpan's place in Nature must for ever remain a mystery.

This was the conclusion I arrived at when my attention was first directed to the subject. But having ascertained that, by crossing carefully selected forms, remote types are sometimes restored in all their original purity, I thought it worth while to make some experiments. In the case of pigeons, by mixing the blood of two well-marked breeds (such as the owl and archangel breeds of fanciers) and crossing the mongrels with a white fantail, I at once obtained birds which closely resembled *Columbia livia*, the recognised wild ancestor of all the tame pigeons.

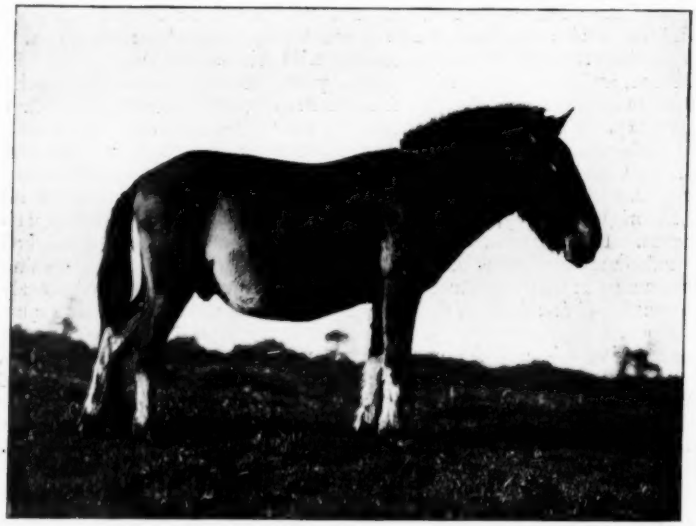
Bearing this and like experiments with zebras, dogs, rabbits, &c., in mind, I selected for my Tarpan experiments a mouse-dun Shetland pony mare, which seemed to me to be a blend of at least three varieties —in its head (Plate I. 1) its suggests the wild horse;* in its mane, tail, and trunk it takes after the forest variety (Plate III. 9); while in the limbs and hoofs it approaches the Celtic pony. This mare was

* The wild horse (*E. prejvalskii*), like Grevy's zebra (*E. grevyi*), has a very long head, the distance between the eye (inner canthus) and the nostril being decidedly longer than in a forest horse, eight inches higher at the withers, and relatively still longer than in the Celtic pony, while, owing to the forehead being decidedly convex, from side to side as well as from above downwards, the eyes look outwards rather than forwards. Like the Celtic pony, Prejvalsky's horse is of a yellow-dun colour, with dark points and only vestiges of stripes—the dorsal band being narrow and the leg bars faint, especially during winter. Unlike the Celtic pony and the forest horse, the mane is upright during at least autumn and winter; in spring it may be only semi-erect; in young individuals out of condition it may, however, arch to one side of the neck. The distal end of the dock carries relatively few long hairs, the basal portion short hairs, while the middle section consists of hairs long enough to form a fringe around the hairs growing from the end of the dock (Plate II. 4). As in the forest horse there are four chestnuts and four ergots, but the hoofs are relatively longer and decidedly more contracted at the "heels." The ears are long and usually project obliquely outwards. In the skeleton it is especially noteworthy that there are only five lumbar vertebræ, and that owing to the sacrum being nearly horizontal the croup droops but little and the tail is set on unusually high, as in many Arabs. The description of the Asiatic "true" Tarpan given by Hamilton Smith, fits fairly well with Prejvalsky's horse. This agreement between the wild horse now living in the Gobi and the Tarpan of the Tahtars has been specially dwelt on by Professor Ridgeway. It is, however, well to bear in mind that Hamilton Smith's drawing of the Tarpan is about as unlike Prejvalsky's horse as any drawing well could be.

crossed with a black Welsh pony, which belongs to an ancient British race and doubtless has in its veins not a little Celtic blood.

The first foal, black like the sire but Celtic in make, failed to throw any fresh light on the question at issue; it, however, supported the view that, notwithstanding the large, heavy head, there was Celtic blood in the Shetland mare. Though in the first foal the Celtic blood prevailed, the second foal, by the same sire, has developed into an animal, now three years old, which, though bred in Scotland, will, I believe, be regarded by Continental naturalists as typical a Tarpan as ever roamed the Russian steppes (Plate I. 2, 3; Plate II. 5).

This Scottish Tarpan, a mouse-dun with black points, has a distinct dorsal band (10 to 15 mm. in width) and faint bars above the knees



A three-year-old wild horse (*E. prejvalskii*) from the Great Altai Mountains, photographed September, 1904; note erect mane and that the tail reaches the ground.

and hocks, a somewhat heavy head, but a short body and well-formed limbs. The mane of a light colour along each side but dark in the centre, is semi-erect, some of the hair arching to the right, some to the left, and some forwards between the ears to form an imperfect forelock. The mane, which resembles that of zebra-horse hybrids, conforms to the description of the mane given by Pallas, but differs from the short crisp mane of Gmelin's specimen, and still more from that of the Moscow Tarpan, which, it will be remembered, reached a length of 45 cm., and hung to one side of the neck. In the dun Shetland dam, the mane lies close to the side of the neck, but never exceeds a length of 35 cm. In the Scottish Tarpan the mane, from 15 to 27·5 cm. in length, is either nearly upright, or, as already mentioned, arches outwards well clear of the neck (Plate II. 2, 3), whereas in a Fetlar (Shetland-Arab) pony of the same age, the mane reaches a

length of 45 cm. and clings to the side of the neck.* The tail of the new Tarpan (Plate II. 5) is even more remarkable than the mane. The dock, which is 27·5 cm. in length, is furnished with three kinds of hair. The basal portion for 6·5 cm. carries fine hair nearly circular in section, which, except in the part continuous with the dorsal band, is almost colourless; the middle portion of the dock—about 13·75 cm.—carries thicker hair, slightly oval in section, with a thick cortex containing in some cases a considerable amount of pigment; from the terminal part of the dock—about 7·5 cm.—spring coarse black hairs which are now long enough to reach the ground. These long hairs are oval in section, have a very thick cortex, and only a small central axis or medulla.

The fine, short, light-coloured hairs (7·5-15 cm. in length) at the base of the tail form a conspicuous somewhat lozenge-shaped bunch (Plate II.); the thicker hairs growing from the middle section of the dock reach a length of 30 cm. They emerge from under the light-coloured root hairs and expand to form a sort of fringe, from which escape the relatively few long black hairs of the distal part of the dock.

In having a limited number of long hairs growing from the distal end of the dock, this cross-bred pony decidedly differs from the Celtic as well as from the forest types of horses. The interest of the tail in the Scottish Tarpan is not so much that it suggests a mule, as that it has a very striking resemblance to the tail of Prejvalsky's horse (Plate II. 4). The only difference is that in the true wild horse the upper or light-coloured section of the tail is longer than in the Shetland-Welsh cross, which has, in fact, the kind of tail one would expect in a Prejvalsky hybrid in which the wild blood was dominant.

I may here mention that I have had under observation for some time two imported Mongol ponies and a half-bred Mongol col In both ponies and colt the tail is peculiar—is about intermediate between that of the restored Tarpan and a forest horse (Plate III. 9). Further, in the colt the mane, though of the usual length, keeps clear of the neck. †

I may also mention that in a dark brown pony from the Outer Hebrides, with a massive head, and long mane like the Moscow Tarpan, the tail consists of three distinct sections; and that in a mare (Plate III. 10) obtained by crossing an Arab with a yellow-dun Norwegian (Fjord) stallion, and in a colt out of a half Arab mare by a similar stallion, the tail forcibly reminds one of the Tarpan obtained by crossing a Shetland mare with a Welsh stallion.‡

A study of the mane and tail of the Shetland-Welsh cross, and of certain other crosses and breeds, strongly suggests that we must include amongst the ancestors of our domestic horses a species having a mane

* Whether the mane is long or short depends on two things; first on the rate of growth of the hair; and second, on how long the individual hairs persist. In the Celtic pony the mane hairs grow at the rate of nearly one inch per month; in the forest variety they may persist until they reach a length of several feet; even in Prejvalsky's horse they may continue to grow until they are long enough to arch to one side of the neck, but eventually in the wild horse, as in zebras, these long hairs give place to short ones.

† This condition of the mane is not unknown in cross-bred horses, and it was specially noticeable in two dun ponies, probably of Spanish descent, which I saw last winter in Mexico.

‡ Seeing that the mane and tail in various breeds, in the Old World and also in the New, often suggest the Tarpan, it may be inferred that the ancestors of the Tarpan were intimately related to the ancestors of some of the domesticated breeds.

and tail such as we find in the wild horse still living in Central Asia. In the body hair and foot-locks the Scottish Tarpan closely resembles the wild horse. Further, it resembles the wild horse in having a very short flank feather, but differs in having the face whorl (Plate I. 3) situated above the level of the eyes, as in the Celtic pony. In Prejvalsky's horse as in the kyang this whorl lies well below the level of the orbits.

In the Shetland mare the dorsal band is nearly as narrow as in the Celtic pony (Plate II. 6); the right hind chestnut measures 1·5 cm. by ·4 cm., while the left is only ·5 cm. in diameter; the front ergots are absent, and the hind ergots are very small. In all these points the Shetland mare approaches the Celtic type. In the Scottish Tarpan the front ergots are small, the hind normal; the front chestnuts are oval as in the wild horse, but decidedly smaller, while the hind chestnuts are only one-fifth the length of those in the wild horse. Finally, in the head, ears, form of the limbs and hoofs, the Tarpan-like Shetland-Welsh cross is as near as possible intermediate between a wild horse and a Celtic pony. Of the skeleton it is, of course, impossible to speak, but judging by the shortness of the trunk, the form of the head, and the conformation of the limbs, the probability is that there are only five lumbar vertebræ, as in the Moscow and St. Petersburg skeletons, and that the skull and limb bones resemble those of a young Prejvalsky horse. After very full consideration, Salensky came to the conclusion that the Tarpan is a type specialised more to the side of *E. caballus* than to *E. prejvalskii*. Doubtless Salensky, in coming to this conclusion, was influenced not a little by the long mane and the full tail of the Moscow Tarpan.

General Conclusions.

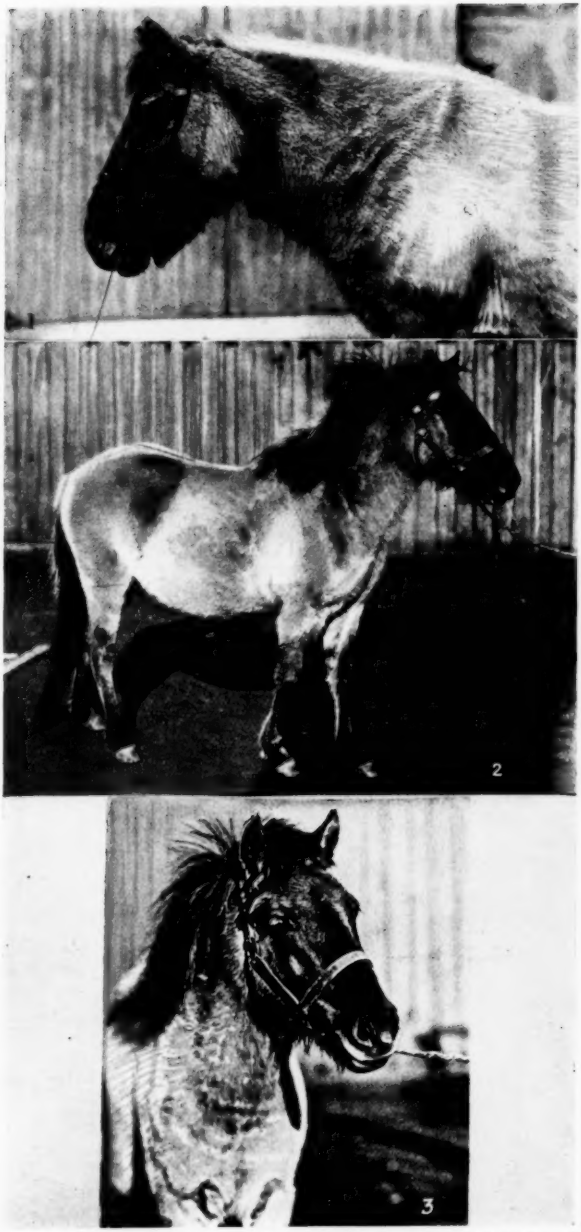
When all the available facts are taken into consideration, there seems no escape from the conclusion that the Tarpan, once common in the east of Europe, cannot be considered as a true wild species.

Further, it may be assumed that the Tarpan herds were derived from at least three primitive stocks, viz.: (1) From a variety or species identical with or closely related to the wild horse (*E. prejvalskii*) still surviving in Central Asia; (2) from a variety having the characteristics of the Celtic pony—*E. c. celticus;* and (3) from a variety resembling the forest horse—*E. c. typicus*. It is only by assuming the multiplex origin of Tarpans that it is possible to account for some of them having a heavy head, long ears, a nearly upright mane, a mule-like tail, and five lumbar vertebræ, thus suggesting *E. prejvalskii;* for others, wanting the hind chestnuts and possessing a skull like that of certain Scottish ponies, thus suggesting *E. c. celticus;* and for others having a thick head, full mane and tail, and hind as well as front chestnuts, thus suggesting *E. c. typicus*.

By experiments now in hand I hope to settle what part Prejvalsky's horse has taken in forming the Tarpan. If I succeed in showing that crosses between Prejvalsky's horse and either the forest, Celtic, or Libyan variety are practically identical with the cross between the Shetland mare and the Welsh pony stallion, I shall prove that at least certain of the domesticated breeds are indebted to Prejvalsky's horse for some of their characteristics, and at the same time bring additional evidence in support of my view that domesticated

Plate I.

Prof. J. C. Ewart.



G. A. Ewart.

FIGS. 1, 2, 3.

For description see page 188.

Plate II.

Prof. J. C. Ewart.

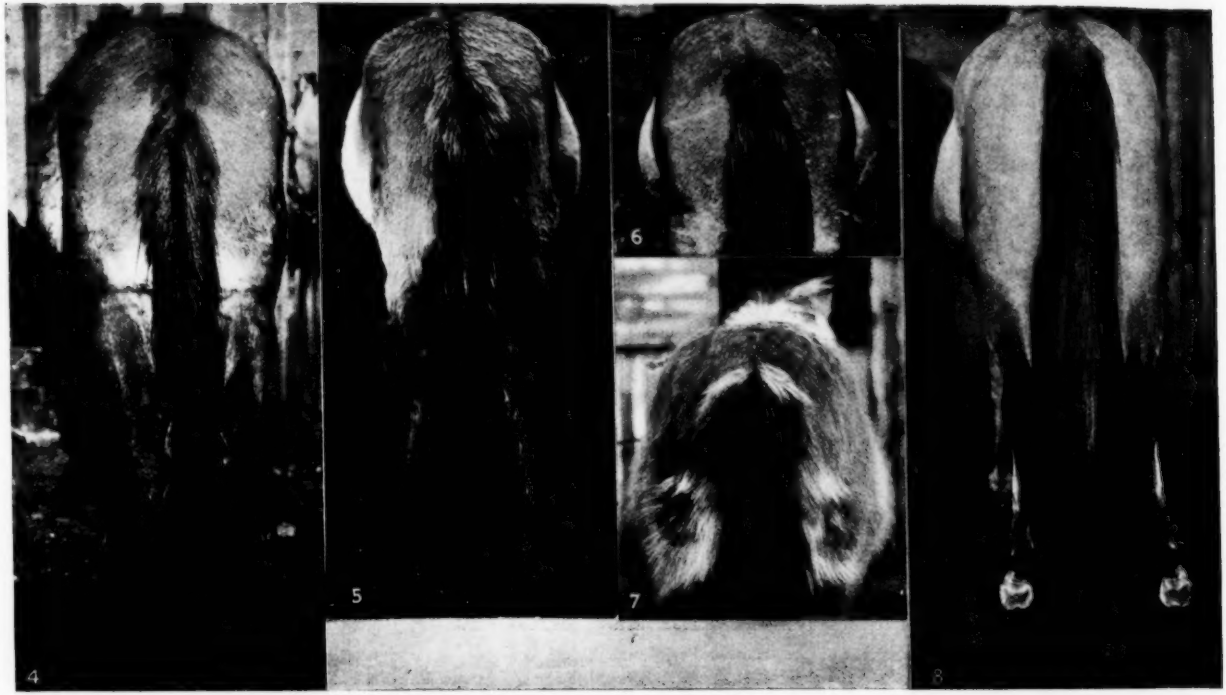


FIG. 4.—E. Prejvalski. 5.—The Scottish Tarpan. 6 and 7.—Celtic Pony, summer and winter. 8.—Arab Mare. [*G. A. Ewart.*

For further description see page 188.

Plate III.
Prof. J. C. Ewart.

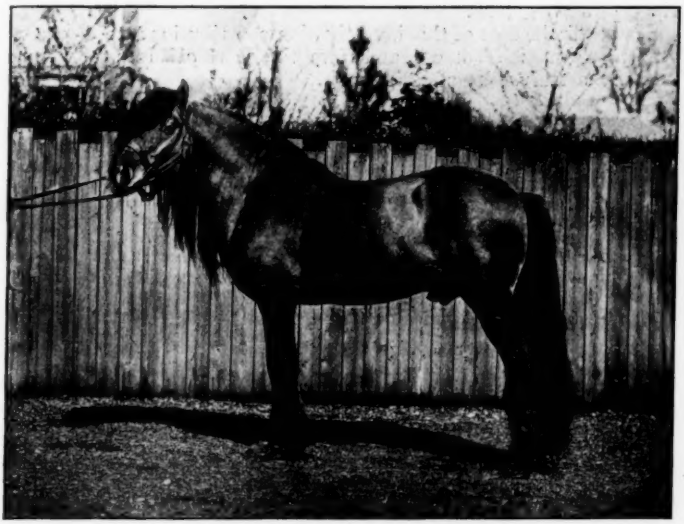


FIG. 9.—Forest Horse from Western Russia.

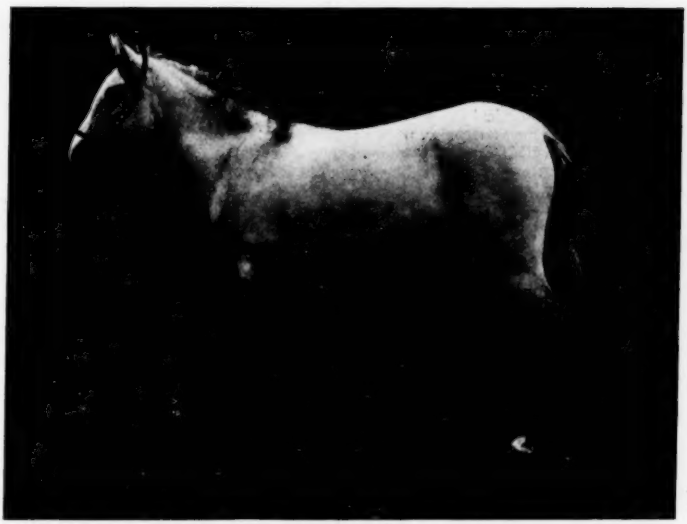


FIG. 10.—Cross-bred Arab and Norwegian Horse.
For further description see page 188.

FIG. 4.—E. Prejvalski. 5.—The Scottish Tarpan. 6 and 7.—Celtic Pony, summer and winter. *For further description see page* 188. 8.—Arab Mare. [*G. A. Fewart.*

races have had a multiple origin, and include plain as well as striped forms amongst their less remote ancestors—have not, in fact, as Darwin thought, descended from a single dun-coloured more or less striped primitive stock.

[Towards the cost of this investigation contributions were received from the Carnegie Trustees, and from the Earl of Moray Research Fund of the University of Edinburgh.]

DESCRIPTION OF FIGURES.

Plate I.

FIG. 1.—Head and shoulders of the mouse-dun Shetland dam of the Scottish Tarpan. In the form of the head, position of the eyes, and distance between the eyes and the nostrils this mare resembles Prejvalsky's horse. A yearling filly out of this mare by a Hebridean pony, instead of resembling a Tarpan, strongly suggests a Celtic pony.

FIGS. 2 and 3.—The mouse-dun, Tarpan-like cross between the Shetland mare (fig. 1) and a black Welsh pony. This pony, though a cross, looks as if it belonged to an old-established race. It has a striking, well-formed, massive head, well-placed ears, full eyes, good quarters, and excellent limbs. The mane is, however, short and semi-erect, while the tail consists of three kinds of hair, which differ in structure, thickness, colour, and arrangement. From photographs taken September, 1905.

Plate II.

FIG. 4.—Hind quarters and tail of a three-year-old wild mare (*E. prejvalskii*) from a photograph taken in September, 1905. The hind quarters and limbs are better formed than in the male wild horse, and the dorsal band is more distinct. In the upper part of the tail the hair, light in colour and relatively fine, grows obliquely outwards from the caudal portion of the dorsal band; the hair of the middle part of the tail, darker and stronger than that of the root, lies nearly parallel with the dock, and reaches to the level of the hocks; the hair of the tip, black, coarse and scanty, but long enough to reach the ground, emerges from within the hair forming the middle part of the tail. Like the hair of the mane, the light hair at the root of the tail is shed annually.

FIG. 5.—Tail and hind quarters of the Scottish Tarpan, from a photograph taken at the same time as fig. 4. As in the wild mare, the hair of the tail consists of three portions. The basal portion only essentially differs from the corresponding portion in fig. 4 by being of less extent and lighter in colour; the middle portion is also lighter in colour and more plentiful than in the wild mare, while the hair growing from the end of the dock in the Tarpan very closely agrees in colour and amount with the terminal portion of the tail in Prejvalsky's horse.

FIG. 6.—Tail of a typical yellow-dun Celtic pony, from a photograph taken in August.

FIG. 7.—Tail of the same pony, from a photograph taken in January.

In fig. 7 the tail-lock is seen at its maximum growth; in fig. 6 a new crop of hair is growing to take the place of the long winter hairs which were gradually shed during the summer.

FIG. 8.—The tail of a grey Arab taken at the same time as figs. 4 and 5. There is no marked difference between the middle and terminal parts of the tail as in the Tarpan, but a few hairs at the root of the tail are short and shed annually; in the most proximal part of the tail this Arab agrees with a half-bred Celtic pony in my stud.

Plate III.

FIG. 9.—Photograph of a typical dark yellow-dun forest horse from Western Ross-shire. The mane, forelock and tail, long and heavy, consists of strong wavy hair. The tail, which shows no vestige of a tail-lock, instead of looking a continuation of the vertebral column, looks as if it had been inserted between the rounded hips. This horse bears a close resemblance to the Gudbrandsdal breed of Norway, and it seems to have entered largely into the formation of the Norwegian Fjord horse. Figures of these Norwegian breeds will be found in Dr. Marshall's paper, a few pages later on in the Journal.

FIG. 10.—Photograph of a cross between a grey Arab (fig. 8) and a light yellow-dun Fjord stallion from Trondhjem. This cross has the long body of a forest horse, a small head, uniting the points of the Celtic and Libyan varieties, and a tail which in some respects resembles the Tarpan (fig. 5). In a cross out of a well-bred Connemara mare by a similar Fjord stallion there is a typical Celtic tail-lock, and the hind chestnuts are absent. A study of crosses obtained by Fjord stallions has led me to conclude that the more typical Fjord horses are a blend of the Celtic and forest varieties.

THE HORSE IN NORWAY.

BY FRANCIS H. A. MARSHALL, M.A. (CANTAB.), D.Sc. (EDIN,), CARNEGIE FELLOW AND LECTURER ON THE PHYSIOLOGY OF REPRODUCTION IN THE UNIVERSITY OF EDINBURGH.*

WRITERS on the origin of the horse and its different breeds have been accustomed to refer to the horses of Norway as though they belonged to a single type. Thus Sanson, in his "Zootechnie," includes the horses and ponies of that country in his sub-species *Equus caballus hibernicus*, to which he also refers the various ponies of the British Isles, the Breton in France, and the horses of Iceland and Sweden. The late Captain Maurice Hayes, in his well-known work on the "Points of the Horse," refers collectively to Norwegian and Swedish horses as though they belonged to one natural group. Professor Ewart, in describing a typical representative of what he calls the Forest type, which, as he shows, differs essentially from the newly discovered "Celtic pony," alludes provisionally to the former as the "Norse horse," because it is common in Norway. Moreover, Professor Ridgeway, in his recently published book on the "Origin and Influence of the Thoroughbred Horse," appears to regard the Norse horse as representing a single type which has undergone greater or less alteration through the introduction of Libyan or other foreign blood.

As a result of a recent visit to Norway, during which I did not neglect opportunities for studying the native breeds of horses and ponies and their history, it has become evident to me—what, indeed, is well recognised by all horse-breeders in that country—that the Norwegian horses at the present day belong to two quite distinct types, which, however, have intermixed to a considerable extent. These two types are represented by the "pure" Fjord horse † and the Gudbrandsdal horse.

It will be remembered that Professor Ewart, in his original paper on the "Celtic Pony," read before this Society in 1902, described this animal as a small-headed horse with short ears, prominent eyes, slender legs, small joints, and a fringe of short hairs on the upper part of the tail, and without hock callosities (chestnuts on the hind limbs) or ergots (fetlock callosities). The most typical colour was light dun. The Celtic pony, as thus described, was stated to occur at the present day in certain of the Western Isles of Scotland, in the north of Ireland, and in the Faroes and Iceland. It was regarded as the living representative of a primitive small horse, whose range extended over North-West Europe, and whose fossil remains are found in the Brighton Elephant Bed.

Living contemporaneously with this ancient Celtic pony, but having perhaps a far more extensive distribution, there was a robust, large-jointed "forest" horse, from which, according to the same authority, the cart-horses and other heavily built horses are largely derived.

It will be well to state at the outset that I regard the Fjordhest as

* Reprinted, by permission, from the *Proceedings of the Royal Society of Edinburgh*, vol. xxvi., 1905-6.

† It is doubtful whether any of the existing Fjord horses are really pure, *i.e.*, unaltered by admixture of Gudbrandsdal or foreign blood.

having been partly descended from the same stock as Professor Ewart's "Celtic pony,"* and the Gudbrandsdal horse as representing the "forest" or "cart-horse" type.

The "pure" Fjord horse is found in all the fjord districts of Western Norway. The largest specimens are said to occur in the Romsdal and in the neighbourhood of Laerdalsören. These may reach about thirteen hands high. The Fjordhest of Northern Norway is considerably smaller and more roughly coated.

So far as I have observed, "Celtic" characters predominate in all the existing Fjord horses. The forehead is flat, and the ears are relatively short, while the limbs are much slenderer and the joints much smaller than in the Gudbrandsdal horse. The hoofs are generally wide at the heels, and almost circular in outline.

Among the suggestions and regulations drawn up for the guidance of judges at the horse show at Lillehammer in 1857, it was recommended that in the Fjord horse "the head should be comparatively small, with well-shaped and well-placed ears, the eyes should be large and the nostrils wide, and the neck must have a suitable arch, and be broad, but it should be fine at its junction with the head." "The colour should be preferably light dun (borkede) or light brown (blak), with black mane and tail, the legs black below the knees and hocks, and the ear-tips black, with cross stripes on the knees and hocks, and with an eel-mark down the centre of the back."† This colour is probably the commonest amongst Fjord horses at the present day. Other colours—browns and greys—and a darker shade of dun are not infrequent, and I have also seen mouse-coloured ponies. Black Fjord horoes are said to be extremely rare, and it is doubtful whether any pure ones exist. Nearly all the light-coloured ponies have a black dorsal stripe, and a large proportion of pure and partly bred Fjord ponies (probably considerably over 50 per cent. of those which I saw) have cross stripes on the legs. Shoulder stripes are also occasionally present, at any rate in certain of the partly bred Fjord horses. Professor Ridgeway, however, says that Dr. Venn, F.R.S., and Mr. J. A. Venn, who, on a visit to Norway in 1904, examined for him a large number of ponies at various coast towns, did not meet with a single instance of striping.

In typical specimens of the Fjordhest, there is in winter time a well-marked caudal fringe or tail-lock. This is not shown in the pony in the photograph (fig. 1), which was taken in the month of August, since the fringe is shed in the summer time, leaving only a bunch of very short hairs in the upper part of the tail. I was informed, however, that in this particular individual a tail-lock consisting of hairs about six inches in length was present in the preceding winter. This pony, like several other Fjord horses which I have seen, had no trace of ergots, but a small callosity was present on each hind leg. In numerous other Fjord horses which I examined, the hock callosities were extremely small, being frequently scarcely larger than a pin's head, but I only succeeded in finding a single case in which these

* Stejneger appears to regard the Fjordhest, the Celtic pony, and also the Tarpan as representing one sub-species, but the evidence he adduces in support of this view is not very substantial.

† "Gudbrandsdal Stud Book" (see under Petersen).

vestiges had disappeared altogether. This was in a pony at Tonsaasen.

In other characters, and more particularly in the length of the body, in the roundness of the quarters, and in being much "tied-in" at the elbow, the Fjordhest of to-day is frequently similar to the Gudbrandsdal and other horses which belong to the "forest" type.

The Fjordhest has been much intercrossed with the Gudbrandsdal horse, and the great majority of the ponies seen in Christiania and the Norwegian towns, and those usually employed to draw the carrioles and stolkjerre are partly-bred animals, the Fjord characters generally strongly predominating. I have found no positive evidence, however, of fjord horses having been crossed with any other breed than the Gudbrandsdal; but since, as I shall show later, the latter breed has from time to time received infusions of foreign blood, it is probable that the fjord horse has been at least indirectly influenced, but probably to no great extent. The ponies used in the sledge races, which take place in winter at Bergen and Vossevangen, are stated to be pure-bred (according to modern ideas), and only such are eligible.

In 1844 an attempt was made by the Norwegian Government to establish a stud of Fjord horses at Hjerkin, on the Dovre fjeld, with the object of improving the breed by judicious selection, but without having recourse to intercrossing with foreign blood. Horses were advertised for, and it was announced in the advertisement that dun-coloured (borkede) animals would be given the preference. Next brown (brun) horses would be considered; and lastly, yellow (gul) horses with white mane and tail would be accepted. Great difficulty was experienced in obtaining animals considered sufficiently good for the purpose, and in the end the scheme proved a complete failure. The stud was broken up, as was also a branch establishment at Foktuen (Dovre), at the end of 1858. The report on the experiment states:—"It is the usual experience that the Fjordhest does not thrive on coming to the mountains; it is, without exception, attacked by strangles, and for the first couple of years is unfit for hard work. Subsequently it becomes enduring and strong in proportion to its size, but the general opinion in these parts is that it is in every respect far inferior to the Gudbrandsdal horse." *

The third figure represents an "Udganger" pony or Nordlandshest. This type, which is now said to be extinct, is stated to have been in most points similar to the Fjordhest, from which, according to the reference to it in the preface to the "Gudbrandsdal Stud Book," it differed chiefly in being smaller and more roughly coated, being subjected to severer conditions of life. Probably the "Udganger" was almost purely "Celtic" in its characters.†

* "Gudbrandsdal Stud Book" (Petersen).

† Professor Ridgeway, who also publishes this figure, says that it represents the last individual of a small distinct breed from the Lofoden Islands (now stuffed in the Bergen Museum). As a matter of fact the "Loftohest" in the Bergen Museum is a dark-coloured individual. Professor Ridgeway regards the animal here figured as a small horse of the heavy type and not a "pony," but I am unable to share this opinion. From enquiries at Messrs. Knudsen's, of Bergen, who photographed the animal in question, I learn that this was done in the month of April, so that the pony would hardly be in its summer coat, as stated by Mr. Ridgeway.

The Gudbrandsdal horse, as will be seen from the figure, is very different from the Fjord horse. The head is large and heavy, the legs are stout and the joints large, the distance between the nostril and the orbit is relatively appreciably larger than in the Fjordhest, and the lower lip frequently projects beyond the upper, as is sometimes seen in English cart-horses. The quarters are very much rounded. Hock callosities are invariably present so far as I have seen, and are generally well developed. Ergots are also present. There is no suggestion of anything of the nature of a tail-lock or fringe of short hairs on the upper part of the tail. The forehead is not generally flat, as in the Fjordhest, but has two ridges which meet below the forelock, and are sometimes very well marked. The Gudbrandsdal horse is also much bigger than the Fjordhest, and may be as much as sixteen hands high.

The following is a translation of Lindeqvist's description, written in the middle of the last century:—"The Gudbrandsdal horse, by careful breeding, and under peculiar local conditions, has developed into the noblest and most valuable representative of the Norwegian horses. It supplies excellent agricultural and artillery horses, and substantial, or even (as things go in Norway) handsome carriage horses." In another place he wrote:—"The Gudbrandsdal horse has such a peculiar stamp that it is usually recognisable anywhere, and amongst a number of horses of different types. The most prominent specimens are about ten quarters (157 centimetres) high,* are usually of brown or dark-brown colour, and are distinguished by their full, round forms; pointed, shapely, and upright ears; expressive physiognomy; compact bone substance and firm muscles; broad and strong knee and hock joints; sinewy legs, and thick, hard and tough hoofs." The chief defect is the "peculiarly short and unbending neck." "This cannot be considered objectionable in the case of working horses, but for the better class of carriage horses, and especially for riding horses (for all of which purposes the Gudbrandsdal is used), this short and thick neck is an undoubted defect." Lindeqvist regarded the Norfolk horse as representing the ideal which the Gudbrandsdal should emulate, but to which, however, it has never attained.

Koller's description, published in 1886, is very similar.

The Gudbrandsdal horse belongs especially to the Hedemarken and Christiania amts, its breeding ground being the great valley from which it takes its name. Those from the lower parts are sometimes known as Döleheste, and those from the upper as Nordheste. The latter are described in the "Gudbrandsdal Stud Book," the first volume of which was published in 1902, as being the finer and the most sure-footed. Gudbrandsdal horses are bred also to a greater or less extent throughout all the south-eastern provinces, as well as in the Trondhjem's amt and some other places on the west coast. The attempt to divide Gudbrandsdal horses into two varieties has in recent years, been practically ignored, for the large, heavy, heavy-legged Dölehest has gained the victory everywhere over the lighter breed, so that the former at the present day may be regarded as the typical representative of the Gudbrandsdal race.

* The height is measured in Norway by tape measure, from over the withers to the hoof.

In former times Gudbrandsdalen was practically one huge stud. In 1729, according to Hiorthoy, there were 157 stallions and 1,563 mares. The stallions used to fight for the possession of the mares, whom they also defended from wolves or other enemies. It appears, therefore, that formerly the horses were subjected to rigorous natural and sexual selection. Pontoppidan says: "The Norwegian stallion shows much courage in fighting wolves and bears, especially the latter, which he attacks, using his forelegs like a pair of drumsticks, and commonly being the master, which some people at Court doubted, until Statholder Wibe, in King Frederick IV.'s presence, made a trial with one of his carriage horses, which at Fredericksborg at once attacked a bear which was let loose, and left no life in it." The mares, on the other hand, are said to have been frequently killed by wolves and bears.

As already mentioned, the horses of the Gudbrandsdal have from time to time received infusions of foreign blood. About A.D. 1040, nine Icelandic stallions were presented by King Einar.* In the race between Magnus Blinde, on horseback, and Harold Gille, on foot, in 1128, it is recorded that Magnus rode a very fast horse from Gothland. Also the Duke Skule, who fled from the battle of Oslo when his horse was shot under him, was procured another from Gothland. These are isolated cases of importation. It is not, however, until a much later period that there is evidence of importation on any considerable scale.

We may probably assume that the Danish and German troops, who were stationed in various country districts in the seventeenth century, brought with them Danish or other foreign horses, and some of these may have bred with the native horses. Indeed, there is a record that, about 1650, in the district east of the Christiania fjord, the horses were mixed both as to size and colour, on account of crossing with Danish stallions brought by the mounted troops. It is also stated by a contemporary writer that horses were imported by a priest, at great expense, into North Gudbrandsdalen from Denmark in the latter half of the seventeenth century. There are also a few records in the "Gudbrandsdal Stud Book" of instances of importation in the eighteenth century, and more numerous ones in the last century. Thus it is stated that Spanish stallions were brought to South-East Norway, while an English thoroughbred, named "Odin," was brought from London, costing £257, and is said during the first four years to have served over a hundred mares. Since then various others have been imported, but it is unlikely that any of these exercised much influence over the Gudbrandsdal breed as a whole.

In 1845 a Government committee reported that it was almost impossible to find any horses which were beyond doubt of unmixed Norwegian descent. In curious contrast to this conclusion is the rule drawn up in 1872 for Government horse shows outside the fjord districts, that only horses of pure Norwegian ancestry would be eligible.

The Gudbrandsdal horse at the present day is usually either black or brown. I was present this year at the great annual horse sale which takes place for a week in August, at Lillehammer,

* This, and certain of the information which follows, was derived from the "Gudbrandsdal Stud Book."

where I had an excellent opportunity of seeing a large number of what are regarded as pure-bred Gudbrandsdal horses, and these were almost invariably either black or brown. Statsconsulent Borchgrevink told me that a pure Gudbrandsdal could not be dun- or light-coloured, the dark colour being now regarded as one of the essential characteristics of the breed. It is interesting to note, however, that there is every indication that the dark colour has resulted from the introduction of foreign blood, for there are numerous proofs that, in the early part of the eighteenth century, dark-coloured horses were the exception. Thus the Dragoon horses in the Gudbrandsdal in 1711, appear to have nearly all been light in colour. It is also recorded that of those in Hedemarken not more than 10 or 11 per cent. were brown or black. Pontoppidan says that the Gudbrandsdal horses were either yellow with black points, and a black "eel" down the back, or else were brown-grey or mouse-coloured. "Black ones are very seldom seen—scarcely one in fifty." Schytte, writing a little later, says that the best horses in Norway are the Gudbrandsdal, "especially the yellow ones with black legs and an 'eel' down the back."

It is to be noted that when the Gudbrandsdal and Fjord horses are intercrossed, the offspring, although shaped much like the pure Gudbrandsdal horses, are very frequently light dun with stripes, but of course it is quite arguable that this character is derived solely from the Fjord parent.

Professor Ridgeway has pointed out that in *Beowulf*, which dates from the eighth century, the horses mentioned are dun or light-coloured, while at a later date, from the names given in the appendix to Sijmon's *Edda*, we get indications of the existence of dark-coloured horses, which, like those mentioned in the Icelandic sagas, Professor Ridgeway regards as affording evidence of the importation of Libyan blood. He considers also that the existence of striped dun ponies points similarly to the conclusion that such an importation had occurred. The first of these conclusions appears to me to be an extremely probable one, but, as we have seen, black horses were very rare until far down into the eighteenth century, so that it is unlikely that the infusion of dark Libyan blood had been at all considerable, and I cannot agree with Mr. Ridgeway in the view that the striped dun ponies show any evidence of having had a Libyan origin.

There can be little doubt that the two types of horses which occur in Iceland at the present day are derived respectively from the ancestors of the original Fjord horse and from those of the unaltered Gudbrandsdal horse. One of the commonest and most typical colours among existing Icelandic horses is light dun with a dorsal stripe. I have searched the "Landnamobóc" or record of the Viking settlements in Iceland,* and although there are numerous references to the importation of horses and other domestic animals, I can only find one to a horse's colour. This is a reference to a stallion which was "apal-grár," which is, I suppose, a shade of dun. But, as the saga of "Burnt Njal" shows, horses of other colours than dun existed in Iceland in the tenth century, and practically all colours are represented there

* *See* Vigfusson and York Powell, "Origines Islandicæ."

at the present time, though light dun is probably still the most frequent.

Professor Ridgeway, in his recent work, has shown that there is Libyan blood in the ponies of the Hebrides and the north of Ireland, while in a paper published two years ago on the "Horse in Iceland and the Faroes," Mr. Nelson Annandale and I have pointed out that a large proportion of the Norse colonists in those islands had been living in the Hebrides or Ireland before they removed to the islands further north, and that it is thus extremely probable that the horses of the Faroes and Iceland are derived partly from the British Isles; so that it is not unlikely that the Icelandic and Faroe ponies have received infusions of Libyan blood through the importation of animals from the Hebrides and Ireland. In this way the red colour of many of the Faroe ponies may probably be accounted for. But since the "Celtic" ponies of the British Isles are not altogether dissimilar to the Fjord horses, it is probable that they themselves have had a Scandinavian origin,* and been subsequently crossed with other horses of Libyan extraction.

In view of these considerations, it seems to me by no means impossible that the primitive small-headed pony of North-West Europe (the horse of the Brighton Elephant Bed) was more closely represented in recent times by the dun-coloured Fjordhest (now probably extinct in its pure form, except in Iceland) than by the red or dark-coloured Hebridean and Faroe ponies; and I am disposed to agree with Professor Ridgeway that certain of the characteristics of the existing "Celtic" ponies (whether in the Hebrides, or in the Faroes, or in Iceland), including possibly the absence of the hock callosities and ergots (which has been shown to be a Libyan character), may be due in part to an infusion of Libyan blood.†

In conclusion, I wish to thank Professor J. C. Ewart for valuable suggestions and information, as well as to express my indebtedness to Lord Melville, H.M.B. Consul-General at Christiania, Mr. Borchgrevink of the Norwegian Agricultural Department, Mr. T. Townshed Somerville, of Christiania, Mr. Gran, jun., of Bergen, Dr. Appelov, of the Bergen Museum, Mr. Johann Fleischer, of Vossevangen, and others who rendered me assistance in my investigations in Norway.

* This is also rendered very probable by the fact, mentioned above, that a number of the Norse colonists settled for some time in the British Isles.

† Mr. Lydekker, in a recent review of Professor Ridgeway's "Thoroughbred Horse" (*Nature*, December 7, 1905), expresses a doubt as to whether the "Celtic" and "forest" varieties, as well as *E. prejvalskii*, should not be regarded as representing a single northern dun-coloured type, which is to be contrasted with a southern and eastern bay type, including the Barbs and Arabs. I am unable to share in the opinion that the first three varieties form one natural group. Representatives of the "forest" or cart-horse type are not "typically small animals with . . . tails often imperfectly haired at the base," neither is the "Celtic" pony ordinarily large-headed and intractable in temper. (For Mr. Lydekker's views concerning the origin of the Barb and Thoroughbred, see *Knowledge*, August 1904.)

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Description of the Plates.

Plate I.

Fig. 1. "Fjordhest," Bergen, 1905. This animal, which was scarcely more than one-half "Celtic" in its characters, was regarded as having all the points of a pure Fjordhest.

Fig. 2. Gudbrandsdal horse, Lillehammer, 1903.

Plate II.

Fig. 3. "Udgangerhest," or "Nordlandshest," Bodo, 1895. This pony was probably almost purely Celtic.

Fig. 4. Hebridean pony.

Figs. 1 and 3 have appeared in the "Gudbrandsdal Stud Book," vols. i. and ii. Fig. 4 is from a block kindly lent by Professor Ewart.

Plate I.

Mr. Francis H. A. Marshall.

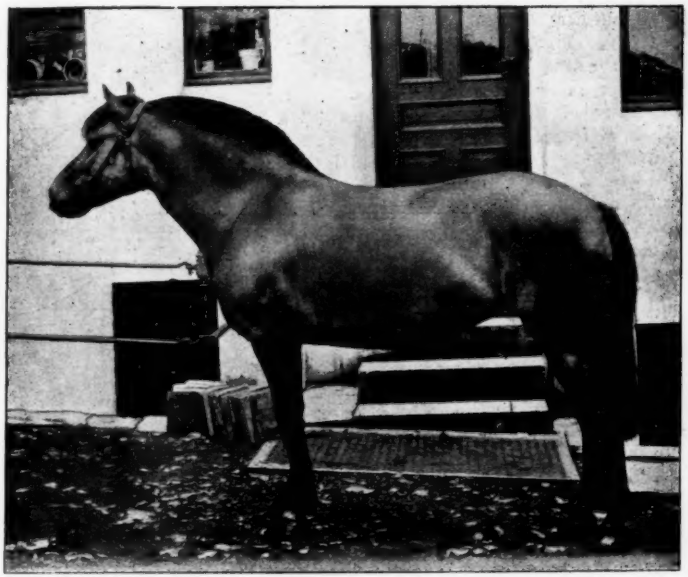


FIG. 1

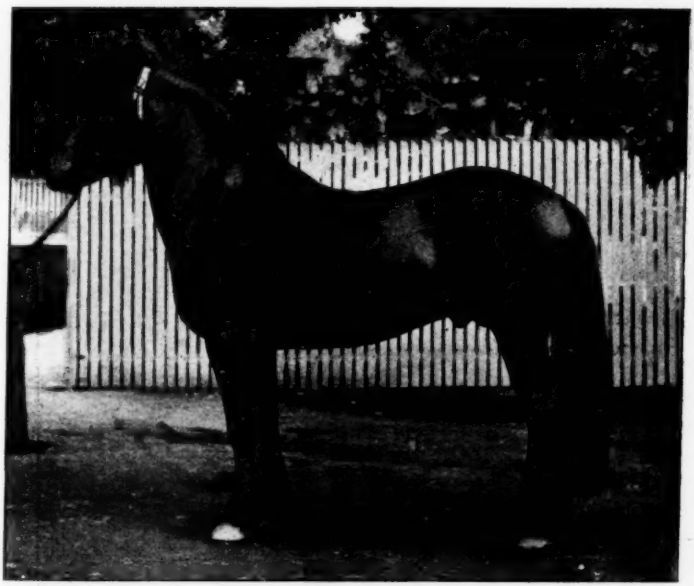


FIG. 2.

For description of the figures see page 196.

Plate II.

Mr. Francis H. A. Marshall.

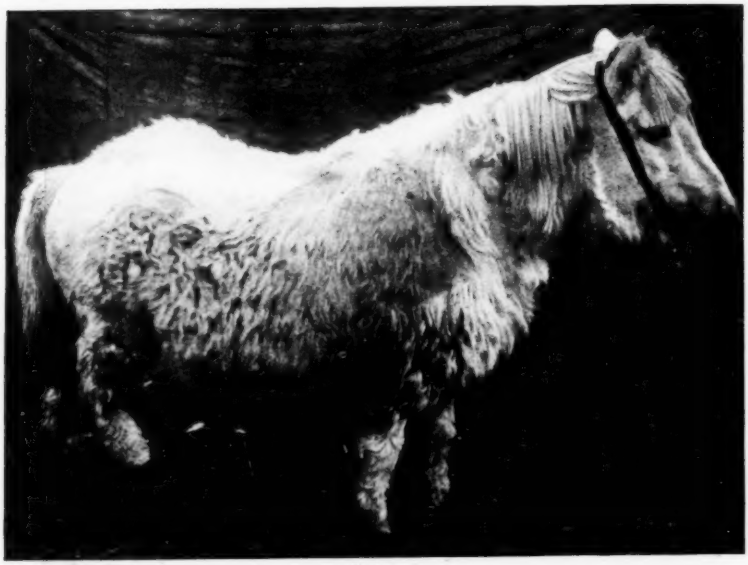


Fig. 3.

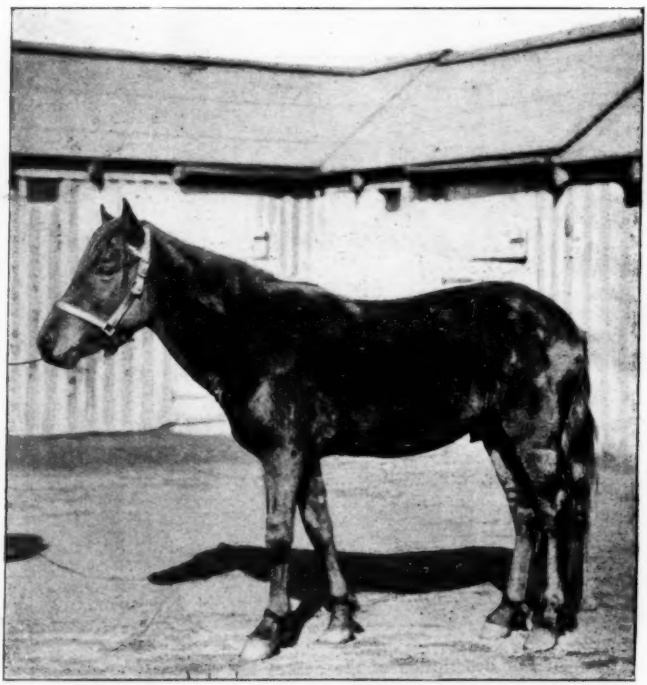


Fig. 4.

For description of these figures see page 196.

A NEW MICROBE, PATHOGENIC FOR RODENTS, *BACILLUS EQUI.**

BY E. KLEIN, M.D., F.R.S.

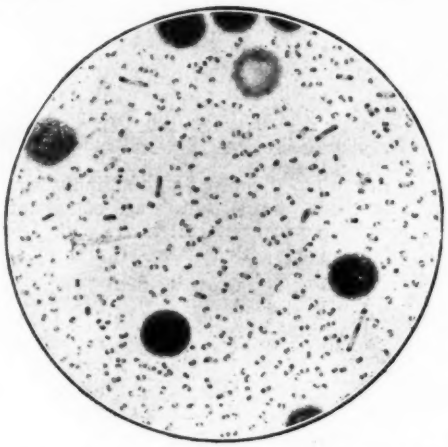
MR. CHARLES J. HUMPHREY, F.R.C.V.S., veterinary inspector, submitted to me a sample of blood of a horse that had suddenly died from an unknown cause. Mr. Humphrey had examined the blood of the animal with a possible view of detecting *bacillus anthracis*, but he failed to do so. Being anxious to have the diagnosis confirmed or negatived in order to have the required administrative regulations carried out, he asked me to examine the above sample of blood. The animal—a private carriage horse—had been in the owner's possession for two and a half years, and had not been laid up ill during that period. The horse was at work in the afternoon, returning to the stable at 5 p.m., and died at 7.45 p.m. the same evening.

The following were the chief symptoms at the *post-mortem* examination made by Mr. Humphrey. There was blood about both nostrils, and the abdomen was swollen; the mesentery was inflamed in patches, with blood extravasations; there were inflammatory patches along the large bowels, the vessels were congested with extravasations, the mesenteric blood-vessels were engorged, and the lungs were congested. My best thanks are due to Mr. Humphrey for supplying me with the preceding notes.

Film specimens of the blood showed a great many small and large groups of bacilli; in these groups there were some not larger than a coccus, others long cylindrical, and all intermediary forms. From this it was therefore evident that Mr. Humphrey's preliminary diagnosis, "Not anthrax," was correct. I injected subcutaneously in the groin of a guinea-pig (1) a fair dose of the blood—about 0·1 cubic centimetre. This guinea-pig developed a soft swelling in the groin and on the abdomen of the injected side, but on the fourth day seemed quite lively. The animal was killed, and on *post-mortem* examination showed about the seat of injection gelatinous infiltrations from which a large amount of turbid, sanguineous fluid oozed out. Under the microscope the fluid, besides containing blood corpuscles, was crowded with short bacilli, some free, others in groups, some almost spherical, like cocci, others longer or shorter cylindrical; they were non-motile; gram negative. Cultures: surface agar plate, agar tube, and gelatin tube, proved that the fluid contained one species only of microbes: non-motile, gram negative, from 0·8 to several micromillimetres in length, in shape of all forms intermediate between coccus-like and cylindrical up to several μ. It was, therefore, quite clear that this result negatived anthrax. All the viscera of the above guinea-pig appeared to be normal. A single colony from the above agar plate was injected subcutaneously in the groin of one further guinea-pig (2). Next day this animal showed a soft, slight swelling about the seat of injection. After another day the swelling had slightly increased, and the animal seemed quiet and off food. Four days after the injection it was in a dying condition. The *post-mortem* examination showed the following appearances: locally there was slight œdema and conges-

* The first portion of this article has already appeared in the *Lancet* for March 17, 1906.

tion; the spleen was enlarged and dark; on the parietal pericardium and the mediastinal pleura there were purulent pseudo-membranes; the lungs were much congested. Film specimens of the pseudo-membranes showed, besides the leucocytes constituting the pseudo-membrane, crowds of the bacilli, many intracellular, others free. In shape, size, and staining they were of the same characters as those used for the injection. Cultures made of a trace of the pseudo-membrane yielded pure cultures of the same species. Film specimens and culture of the spleen showed great abundance of the same microbes. The heart's blood contained the microbe, but not less in numbers, a platinum loop of the blood yielding an almost confluent mass of colonies. With a single colony from an agar plate of the heart's blood of this guinea-pig I injected subcutaneously one large rabbit. The animal died four days after; it had local inflammation, thin pseudo-membranes on the liver and on the enlarged spleen,



Film specimen of heart's blood of rabbit, injected per ear veins with emulsion of *bacillus equi*. The animal was found dead within twenty hours. The specimen was stained in methyl blue eosin. The bacilli show conspicuous bipolar staining. They greatly exceed in number the red blood discs shown here as dark discs. Magnifying power 1,000.

pseudo-membranes on the mediastinal pleura; the pseudo-membranes of the liver, the spleen, and the pleura showed in film specimens and culture abundance of the bacilli. A similar result was obtained with the tissue of the spleen; the heart's blood also contained great abundance of the bacilli.

From these experiments it follows that the original blood of the horse contained abundance of a microbe which proved pathogenic and fatal to the guinea-pig, and, through this, to the rabbit. the microbe in small doses (a single colony) causing death in four days with pseudo-membranes on the viscera, with abundance of the same microbe in the pseudo-membranes, the heart's blood, and the spleen. The microbe, for which I propose the term *bacillus equi*, resembles in shape and size the *bacillus pseudo-tuberculosis* (A. Pfeiffer), possessing all inter-

mediate shapes between a coccus and a cylindrical, almost filamentous bacillus, and being non-motile and not liquefying gelatin; but in action it obviously differs from it, the former causing acute illness, and not producing the well-known necrotic nodules in the spleen, the liver, the lung, and the lymph glands characterising the action of *bacillus pseudo-tuberculosis*. The *bacillus equi* grows well at 37° C., and at from 20° to 21° C. it forms round, more or less flat, moist, translucent colonies both on agar and on gelatin; it grows slower and is distinctly more translucent than the *bacillus pseudo-tuberculosis*. The *bacillus equi* is practically gram negative; the oval forms, both of culture and of the animal tissues, show conspicuous bipolar staining with methylene blue. The *bacillus equi* does not alter neutral red broth, litmus milk, lactose peptone, or litmus glucose bile salts (MacConkey fluid). In alkaline beef broth it forms slight but uniform turbidity; no pellicle. *Bacillus pseudo-tuberculosis* leaves the fluid fairly clear but forms copiously granules and flocculi with pellicle on the surface (where the fluid touches the glass). The *bacillus equi* does not form spores and is devitalised by complete drying. Dr. Mervin H. Gordon has kindly subjected in comparative series both the *bacillus equi* and the *bacillus pseudo-tuberculosis* to the various sugar tests, and he finds as the chief and constant differences that while *bacillus pseudo-tuberculosis* forms acid from maltose and not from saccharose, the *bacillus equi* behaves in a contrary way, inasmuch as it forms acid from saccharose but not from maltose.

As already mentioned, the action of *bacillus pseudo-tuberculosis* and of the *bacillus equi* is fundamentally different. As a further distinction may be mentioned the fact that while *bacillus pseudo-tuberculosis* retains its pathogenic action unimpaired in subcultures after many months' transference, the *bacillus equi* rapidly loses its virulence in subcultures.

Another microbe to which the *bacillus equi*, by certain of its characters, appears closely related is the bacillus of fowl cholera. As will be gathered from the appearance of the colonies on agar and gelatine, above described, there is no doubt that the *bacillus equi* resembles the bacillus of fowl cholera in a marked manner. This resemblance is further borne out by the following characters: (*a*) the *bacillus equi*, as also the bacillus of fowl cholera, forms uniform slight turbidity in broth and produces indol; (*b*) both microbes are gram negative; (*c*) both microbes in film specimens, particularly of the tissues of the infected animal, show marked bipolar staining.

A rabbit injected by the ear vein with culture of either the *bacillus equi* or the bacillus of fowl cholera dies within twenty hours, the blood containing abundance of the microbe. Now, comparing the two microbes by the intravenous injection into the rabbit carried out under precisely the same conditions, the following differences will be noticed: (*a*) the fowl cholera rabbit is found dead in less than eight hours; the *bacillus equi* rabbit is ill after eight hours, but is not dead before eighteen or twenty hours; (*b*) in the blood of the fowl cholera rabbit, the microbes, as is well known, are fairly numerous, but not comparable to what is the case in the blood of the *bacillus equi* rabbit. The accompanying photogram is prepared from a film specimen of the heart's blood stained in methyl blue eosin; it will be noticed that the number of the bacilli far surpasses that of the red blood discs; in the blood of comparative fowl cholera rabbit a single field of the micro-

scope does not show more than about a dozen microbes amongst hundreds of red blood corpuscles; (*c*) another, though slight, difference exists as regards the size of the microbe; for the *bacillus equi* in the blood of the rabbit is longer than the bacillus of fowl cholera, in the former case there are a good many more cylindrical and oval ones than in the latter.

Mice injected in parallel series subcutaneously with an emulsion of agar culture of *bacillus equi* and of bacillus of fowl cholera yield striking results; injected with bacillus of fowl cholera all mice die—be the dose small or large—in thirty to forty-eight hours, sometimes in the case of the larger dose sooner, in the case of the smaller dose later; the blood, the spleen, and in fact all the organs contain abundance of the bacilli, but it is different with the mice injected with the *bacillus equi*. When mice are injected subcutaneously in the dorsum with a small dose—a drop or two—the utmost that will happen, in a small number of cases, is an ulceration of the skin, followed by death in two, three, or more days. On *post-mortem* examination the spleen is found enlarged, the lungs congested. The most careful search by film specimens as well as by culture, fails to discover any bacilli in the heart's blood, in the spleen, lung, or liver. If the larger dose is injected, 3 to 4 minims, the animals die in twenty-four hours. On *post-mortem* examination there is local inflammation with exudation, the spleen is enlarged, and the liver congested. But the most careful search by film specimens as well as by culture fails to discover any bacilli either in the heart's blood, or the spleen, lung, or liver. From this it is clear that while the bacillus of fowl cholera acts on mice as it does on the rabbit, viz., as a true pathogenic microbe, causing a general septicæmic infection, the *bacillus equi* does not behave towards the mouse like a pathogenic microbe; it causes no infection, although in sufficient dose is capable of causing toxic action.

Another striking difference between the two microbes is shown by their relation to the pigeon. As is well known the pigeon subcutaneously injected with a small dose (a drop or two) of bacillus of fowl cholera dies acutely from general infection, the vascular system in all organs containing abundance of the microbe; but injected with a far larger dose, one-third to one-half of a cubic centimetre, of a turbid emulsion of a recent agar culture the pigeon does not respond, but remains unaffected. While then it has to be admitted that owing to certain characters the *bacillus equi* and the bacillus of fowl cholera are close relations, they are in several important respects distinct and different microbes.

Clinical Articles.

EPILEPTIFORM ATTACKS IN THE PIG.

BY HENRY TAYLOR, F.R.C.V.S., HAYWARDS HEATH, SUSSEX.

Six young pigs, about six or eight weeks old, were being fattened together in a yard. One morning the owner noticed that two of them came to the trough as usual at feeding time, partook of a small quantity, and then backed away and fell down in a fit. Being at the place one day the owner mentioned the occurrence to me, and asked if I would like to witness the performance, saying it could be brought on by simply feeding them. Accordingly some food was placed in the trough, the animals came to feed, all looking in good condition, and to all appearances healthy. When they had eaten five or six mouthfuls ravenously, two of them backed away, keeping their mouths open as if they had partaken of some irritant liquid, walked about two yards, then fell on their sides. They lay there kicking and convulsed, somewhat similar to the death gallop of an expiring horse. In one animal the legs were then slowly drawn up to the body. Both squealed loudly for half a minute or so. The convulsions ceased in a short time, and the animals lay almost still. One recovered in two minutes from the commencement of the attack, then came and ate at the trough absolutely as if nothing had ever happened to cause a break in the meal. The other pig looked sleepy for some time afterwards, and did not attempt to feed; he took much longer to come round.

The food consisted only of sharps and water, and the same sharps had been used for a couple of weeks. To the naked eye they appeared all right.

I recommended a change of food nevertheless, and the animals received some magnesium sulphate and potassium bromide mixed amongst the total feed. The latter was about one drachm each pig per day. Whether the affected animals got much of the drug or not I am unable to state, but the owner informed me that the fits diminished in frequency, and shortly afterwards ceased.

A CASE OF TETANUS IN THE PIG.

BY HENRY TAYLOR, F.R.C.V.S., HAYWARDS HEATH, SUSSEX.

The animal in question was a small one, about eight or ten weeks old, and had been running along with some more in a farmyard. The farmer had previously lost one showing identical symptoms.

When I saw the former he was lying in an excavation in a manure heap. The symptoms shown were hardness and rigidity of the muscles of the back, loins, neck, &c., trismus, and stilty action—in fact all the classical symptoms of the disease. He did not squeal so much as a pig with rheumatism when made to move. There were two rather

amusing symptoms. The first was the alteration in the position of the ears. He was of the breed known as Sussex, and in this type the ears droop and hang right over the eyes. As the disease came on, the owner informed me, the ears had gradually had their tips elevated until they were almost prick ears. The other curious symptom had reference to the tail; this became coiled over the hind quarters, something after the manner of a watch spring. I tried to uncoil it, but I had to desist for fear of fracturing the appendage. I could not detect any wound, nor was there any history of one.

With regard to the treatment the owner decided on a course of masterly inactivity, and the animal showed his appreciation of such kindness by eventually recovering.

PARASITIC ENTERITIS IN YOUNG PIGS.

BY A. S. WILLETT, M.R.C.V.S., STAINES.

A SHORT time ago I was summoned to attend four valuable five-weeks-old pigs of the Berkshire breed. One had died during the night and another was very ill.

A careful *post-mortem* examination of the dead animal revealed enteritis of the large bowel, and adherent to the mucous membrane were numerous thread-like bodies.

With a great deal of care I removed some of these without much injury to the parasites.

I then destroyed the second pig and found a similar condition, but the enteritis was not so extensive, and the thread-like bodies were less numerous.

These bodies measured from $1\frac{1}{4}$ ins. to $1\frac{3}{4}$ ins. in length, the anterior two-thirds being about a third of the thickness of the posterior third, and resembled parasites found in the intestines of the sheep. Under the low power of the microscope all the females I examined were quite full of eggs, and were afterwards identified by an expert as the *Tricocephalus crenatus* of the pig, these being similar to the *T. affinis* in sheep and the *T. dispar* in man.

The following points are interesting:—

(1) Their comparative scarcity.

(2) That according to Neuman the parasites are adult at four weeks; and these were undoubtedly adult, though the affected animals were but five weeks old, leading one to infer that they must have been infected through the mother's milk.

(3) That they are supposed to cause but little trouble, whereas, to my mind, they were the cause of death in this case.

The remaining two pigs were treated with anthelmintics, and appear to be healthy and thriving.

A CASE OF ABSCESS IN THE SPINAL VERTEBRA OF A BULL.

BY T. STAINTON, M.R.C.V.S., READING.

THE patient, a four-year-old Shorthorn bull, in fat condition, shortly after being used at service, was observed to be a little out of sorts and to be suffering from constipation, together with a staggering gait behind. When I saw the animal on December 24, 1905, the appetite was not at all impaired, the temperature normal, and the respiration only just a little accelerated.

I did not make any definite diagnosis, but administered a purgative dose, following this up with full doses of nux vomica and ammonium carbonate.

The bowels resumed their normal character, and there was a distinct improvement in the gait until December 30. On the 31st the animal was lying down and unable to rise, ruminating and not constitutionally disturbed. By my advice, as I thought further treatment very speculative, and as the animal was good meat, the butcher was called in. The carcase weighed 164 stone.

Post mortem revealed an abscess in the centre of one of the lumbar vertebræ.

AN INTERESTING CASE OF UTERINE TUMOURS.

BY F. C. HOBBS, M.R.C.V.S., CARDIFF.

THE patient, a toy Yorkshire terrier, about five pounds weight, fourteen years old, had been in the owner's possession twelve and a half years; she had never had puppies, and was first brought under my observation five years ago owing to a slight catarrh of the bronchial tubes.

I prescribed febrifuge medicine and inhalations of eucalyptus twice daily, and she made a rapid recovery.

About six months after this my attention was called to a hæmorrhagic discharge from vagina, and I noticed a tumour about the size of a hazel nut. It was well defined, firm to the touch, and situated on the vulva. The tumour was removed, and the patient speedily recovered. Neither the tumour nor the discharge had any appreciable effect on her general health.

Eight months after the operation another one developed at the seat of the old tumour, and still another large one was discovered in the body of the uterus. With the exception of discharge, which occurred at first intermittently, then persistently, she remained in good spirits.

At my suggestion a consultation was arranged with Professor Hobday in London, and, as the tumour was large and not causing any particular danger to health, taking into consideration her age, we mutually agreed that it would hardly be wise to submit her to an operation.

Finally, on February 16, by the owner's request, the little dog was

painlessly put away with chloroform, as the vaginal discharge had become very offensive.

The photograph clearly shows the extent of the mischief. The uterus and tumours together weighed 4½ ounces, each ovary was

Tumours of the vagina, uterus, and ovaries of a bitch.

about the size of a filbert nut, and the tumour in the uterus was about as large as a big walnut.

The growths were submitted to Dr. Shattock, Pathologist to St. Thomas' Hopital, and this gentleman declared them to be fibro-myomata.

THE TREATMENT OF HÆMOGLOBINURIA WITH SUGAR.

BY R. LEWIS GREEN, M.R.C.V.S., DUDLEY.

THE treatment adopted for this affection is not original, but I believe it was a contribution to the *Veterinary Record*, from which I copied it, about fifteen or eighteen months ago, and to the author I acknowledge my indebtedness.

The treatment laid down is as follows:—

Have the body and limbs rubbed well with wisps and wrapped up, and turn the animal frequently. Pass a catheter if necessary, and give bromide of soda grs. 50 to 70. After the lapse of half an hour, give raw sugar 1 lb. dissolved in water.

The raw sugar is repeated every six hours, and the sodium bromide every twelve hours. As the urine becomes lighter in colour discontinue the soda, but keep on with the sugar.

If the description of the treatment in the foregoing does not appear very plain to my readers, I think by looking through Case 2 it will be grasped at once. I may here add, for the sake of one's reputation, and to the younger members particularly, to whom a little tact of practice might be useful (the older ones I leave to take care of themselves), it is far better to take the sugar already dissolved as a drench than dispense it in the presence of one's client, as the original cost of this agent is about 2½d., and you intend charging 1s. or 1s. 6d. per dose.

It is easily done. Take a quart jug containing 1 lb. sugar, adding sufficient boiling water to dissolve, then pour it into an ordinary wine or spirit bottle, and fill up with cold water; this is one drink. Repeat with three others, and you have sufficient to carry on for a period of twenty-four hours. Put on each a label and fill in the time each drink is to be given, as this obviates them getting mixed. I did not keep notes of Case No. 1, but will give particulars as fully as possible from memory.

Case 1.—Roan waggon gelding, 4 years old, weight 19¼ cwts. The attendant was anxious to make him turn the weighing machine at a ton, consequently increased his feed more in the direction of Indian corn and beans than chaff. He went to work one morning, and after the lapse of about an hour became unsteady in his gait. Finding that the horse did not become any better after resting a little while, and being close at home, the man took him into the stable and reported to the office.

The horse-keeper put him in slings and telephoned to us. Reaching there a short time afterwards, I found the animal standing in a propped position, *i.e.*, with the legs wide apart. There was the usual tense feeling across the loins, and the urine was the colour of porter. As he was not putting undue weight in the slings, I decided to leave them on, and gave instructions as to nursing, &c.

He was put on the soda bromide and sugar treatment at once, grs. 50 of the former each dose, of which he only had three. In twenty-four hours the urine cleared, and the bromide was then stopped, but the sugar was continued for forty-eight hours longer, when ferri. sulph., ac. nitro. hydrochlor. dil. and quinine was substituted, and continued for a week. He was taken out of slings after the lapse of three days, lying down and rising without difficulty.

The diet consisted of cold bran mashes for two days, then cold bran and chaff with cold water to drink seven to ten days.

This animal made a complete recovery.

Case 2.—Subject, brown mare cob, 6 years old, 15 hands. This animal was owned by a manufacturer four to five miles from here, who kept her for private purposes.

History.—She had been in the stable a week without alteration of diet, and was taken out for a smart trot. After about two miles on the road she broke out in patches of sweating, especially across the loins, and being unable to proceed with her the owner turned and walked her home, reaching the stable without mishap.

I arrived about 11 p.m. She urinated as I walked into the stable, and it was as dark-coloured as some they had caught and kept for me to see.

The following is a complete chart of medicine, &c.:—

Dec. 15th, 11 p.m.	...	℞ Sodæ Bromide ...	1 dr.
		Aloes Barb. ...	3 drs.
11-30 p.m.	...	Sugar	1 lb.
„ 16th, 5-30 a.m.	...	Sugar	1 lb.
11 a.m.	...	Sodæ Br.	1 dr.
11-30 a.m.	...	Sugar	1 lb.
5-30 p.m.	...	Sugar	1 lb.
11 p.m.	...	Sodæ Br.	50 grs.
11-30 p.m.	...	Sugar	1 lb.
„ 17th, 5-30 a.m.	...	Sugar	1 lb.
11 a.m.	...	Sodæ Br.	50 grs.
11-30 a.m.	...	Sugar	1 lb.
5-30 p.m.	...	Sugar	1 lb.
11 p.m.	...	Sodæ Br.	50 grs.
11-30 p.m.	...	Sugar	1 lb.
„ 18th, 5-30 a.m.	...	Sugar	1 lb.
11 a.m.	...	Sodæ Br.	50 grs.
11-30 a.m.	...	Sugar	1 lb.
5-30 p.m.	...	Sodæ, discontinued, urine almost normal.	
11-30 p.m.	...	Sugar	1 lb.
„ 19th, 5-30 a.m.	...	Sugar	1 lb.
11-30 a.m.	...	Sugar	1 lb.

It is worth while to note that a dose of aloes was given in this case, owing to the constipated condition of the bowels. The dose of bromide was increased to 1 dr. and dropped to 50 grs. This animal was likewise subsequently placed on the ferri. sulph. acid and quinine treatment, and made a complete recovery.

A FURTHER NOTE UPON THE OVARIOTOMY OF TROUBLESOME MARES.

BY FREDERICK HOBDAY, F.R.C.V.S., F.R.S.E., KENSINGTON, W.

On several occasions attention has been drawn to the operation of ovariotomy for troublesome mares, in papers read before Veterinary Medical Associations (*Veterinary Record*, vol. xii., p. 359, and vol. xiv., p. 306), and in the *Journal of Comparative Pathology and Therapeutics* of March, 1902, I published a summary of twenty consecutive cases; whilst in a little monograph entitled "The Castration of Cryptorchid Horses and the Ovariotomy of Troublesome Mares," published in 1903, I recorded as far as possible the details of some thirty consecutive cases. I purpose now to briefly tabulate again these thirty cases, and, in addition, to give the details of some twenty more—making fifty altogether—consecutive, and not in any way selected, cases, the object being to watch the results and endeavour to pick out likely or suitable cases for successful issues on other occasions.

No.	Date of Operation	Breed.	Age (years)	Reason for Operating	Result and Remarks, to 1906.
1	22.7.99	Van	10 or 12	A bad kicker	Slight improvement, but still very troublesome.
2	26.11.99	Cart	9 or 10	Very vicious	Died four days later; proved to be pregnant.
3	27.12.99	Hackney ..	9 or 10	Very vicious in harness ..	No improvement.
4	17.12.99	Thoroughbred	3	To prevent œstrum ..	Satisfactory; still working.
5	27.4.00	Carriage mare	5	Troublesome during œstrum	Satisfactory; still working.
6	19.7.00	Carriage mare	10 or 11	Vicious in harness	Temporary improvement only; died of twisted gut, Sept. 25.
7	10.9.00	Hunter ..	7	Uncertain when in œstrum	Satisfactory improvement.
8	16.10.00	Hunter ..	13	Troublesome in œstrum ..	Satisfactory.
9	16.2.01	Trotter ..	3	Troublesome in œstrum ..	Died of pneumonia in April.
10	9.3.01	Thoroughbred	6	Removed the right ovary (diseased)	Satisfactory; has had three foals since.
11	3.4.01	Carriage mare	11	Troublesome in œstrum ..	Satisfactory; still working.
12	12.7.01	Carriage mare	13	Troublesome in œstrum ..	Satisfactory; still working.
13	1.8.01	Omnibus ..	7	Vicious kicker	Satisfactory; still working in a brougham.
14	17.10.01	Hunter ..	9	Troublesome in œstrum ..	Satisfactory.
15	17.10.01	Cart mare ..	8	Very vicious	No improvement, except that troublesome urination did not occur.
16	26.10.01	Thoroughbred	7	Troublesome kicker ..	Satisfactory for three months, then relapsed.
17	9.12.01	Hunter ..	7	Troublesome in œstrum ..	Satisfactory.
18	9.12.01	Hunter ..	6	Bad kicker	Satisfactory.
19	8.2.02	Polo	aged	A bad squealer and kicker	Satisfactory to ride, but lost her courage for polo.
20	22.3.02	Brough'm mare	11	A bad kicker	Satisfactory.
21	18.4.02	Polo	8	Very dangerous	No improvement.
22	22.6.02	Omnibus ..	8 or 9	Very vicious	Satisfactory; died of twisted gut, July 13.
23	1.8.02	Hunter ..	8	Uncertain when in œstrum	Satisfactory; still working.
24	26.9.02	Hunter ..	13 or 14	Kicks in harness	Was not again tried in harness.
25	15.10.02	Thoroughbred	8	Excitable in œstrum ..	Satisfactory.
26	15.10.02	Thoroughbred	8 or 9	Always in œstrum	Satisfactory.
27	1.11.02	Hackney ..	8 or 9	Kicker in œstrum	Satisfactory; working still.
28	21.11.02	Hunter ..	4	Very vicious kicker ..	Satisfactory.
29	5.12.02	Cart mare ..	9½	Very vicious kicker ..	Worked satisfactorily until April, 1903, then again began to kick, and was sold.
30	10.12.02	Cob	7	Uncertain when in œstrum	Apparently satisfactory, but met with accident in the field shortly afterwards and was killed.

Case 31.—In conjunction with Major Meredith, F.R.C.V.S., February 25, 1903. Polo mare, seven years old, had been for the past ten or twelve months continually in œstrum, and when in this condition was useless for her work, kicking and being dangerous with the other horses, besides refusing to play. Both ovaries were almost cartilaginous to the touch and very cystic; they were enlarged to quite half as big again as their normal size. After the operation she immediately lost all her bad habits and was without difficulty got into good condition.

In June the owner refused more than £100 for her; in December she was still all right, and she has given every satisfaction up to the present date.

Case 32.—In conjunction with Mr. C. H. Sheather, M.R.C.V.S., March 6, 1903. Polo mare, six years old, in the present owner's possession about eight months. She was an excellent player except when in œstrum, and when like this squealed and refused to budge a step. She would lie down if thrashed or spurred, and was as obstinate as a mule.

March 8.—She was dull and somewhat off her feed. Thinking this was due to constipation, a dose of castor oil and an enema were

administered and the symptoms apparently passed off. She was put to work on the 16th, and was also put in harness, a thing the owner had never dared to try before. She went well, was perfectly quiet, and her squealing habit appeared to have ceased.

April 4.—The mare was dull and had colicky pains. Examination of the vagina revealed a large fluctuating swelling which was punctured with a trocar and cannula; 120 ounces of a clear serous fluid were withdrawn. A warm enema was administered *per rectum* and a dose of oil given internally.

Progress was uneventful until the 17th, when she again seemed in pain. On the 19th there was again a swelling in the vagina; this was lanced with a Colin's knife and some fourteen pints of blood-stained, purulent, flocculent fluid withdrawn. The vagina was afterwards syringed daily with chinosol lotion, and recovery was uneventful. As soon, however, as the mare got full of corn and in good condition again, she recommenced her bad tricks, and was sold at Tattersall's about May 18 and lost sight of.

Case 33.—In conjunction with Major Meredith, F.R.C.V.S., June 16, 1903. A trooper mare, nine years old, quiet in the stable, but for two years a troublesome kicker and squealer in the ranks. She had lately become quite unmanageable. The left ovary was enlarged and cystic and the right ovary cirrhotic. On the 25th Major Meredith wrote: "The mare has not been the least bit uneasy since the afternoon of the operation; the temperature and pulse have at no time been disturbed."

The animal went back into the ranks, and was perfectly cured at once of all her bad habits. In the second week in August she had colic, and died of a twist of the bowel. *Post-mortem* examination, made by Major Meredith, revealed no reason for this, nor yet any connection with the operation.

Case 34.—In conjunction with Mr. W. Reid, M.R.C.V.S., July 13, 1903. A cab mare, nine years old, always in œstrum winter and summer, uncertain in temper, and occasionally a vicious kicker. Both ovaries were cirrhotic. Recovery from the operation was uneventful, and she was sent to work ten days later. She has worked quite satisfactorily up to the present time.

Case 35.—July 24, 1903. A Welsh mare, nine years old, which had been in the owner's possession for two months. She was very dangerous both in the stable and out, and absolutely unmanageable. Recovery from the operation was uneventful, and she was tried in harness a fortnight later. For a day or two she was uncertain and attempted to kick, but presently she quietened down and worked satisfactorily.

Case 36.—In conjunction with Mr. Harding, M.R.C.V.S., August 10, 1903. Polo mare, eleven years old, started kicking and squealing suddenly when at work in June and has done it repeatedly since, apparently without any provocation whatever. She had been in the owner's possession for six years, and had never had a foal to his knowledge.

The left ovary was enlarged, and both were cystic and very cirrhotic. For three or four days after the operation she was dull and did not eat much, but recovery otherwise was uneventful, and she was walked home, a distance of several miles, on the 14th. She was tried

at work on November 3, but as she still attempted to kick she was turned out for a couple of months. When brought up from grass her habits had not improved, and she eventually had to be sold as incurable.

Case 37.—In conjunction with Mr. F. C. Gillard, M.R.C.V.S., October 27, 1903. A pony mare, eleven years old, a kicker when being put into harness if in œstrum, and also uncertain when being driven. Both ovaries were cystic, the right one being the larger of the two. The mare was constipated for four or five days afterwards, but never showed any rise of temperature, and was tried again at work about three weeks later. The operation did not have the desired effect, and she seemed much about the same as before it was done. It did not improve her.

Case 38.—In conjunction with Mr. Gryspeerdt, M.R.C.V.S., November 11, 1903. A cart mare, five years old, which had never had a foal. She was quiet in her work, but squealed and kicked viciously in the stable at night, and had injured her legs through this habit. When operating, after making the incision above the "os," my hand went directly into the body of the uterus, which was dilated. After making sure of this fact I withdrew it and made a fresh puncture below the "os," gaining the abdominal cavity in this way. Both ovaries were enlarged and cystic. Recovery was uneventful. In December I heard that the bad habit had apparently entirely ceased, and the animal's legs were then blistered to remove the thickening which had been caused by kicking. She was afterwards turned out to grass.

In September, 1904, I heard from Mr. Gryspeerdt saying that the mare had relapsed into her bad habits again, and had been sold and lost sight of.

Case 39.—In conjunction with Mr. Walter Perryman, M.R.C.V.S., December 9, 1903. A cart mare, seven years old. She had started kicking a month ago, and since then whenever in œstrum had become hysterical and as if mad. She was at these times quite unmanageable. She was sent to work after the operation on January 21, and has worked satisfactorily up to the present time.

Case 40.—In conjunction with Professor Williams, F.R.C.V.S., and Mr. Laird, M.R.C.V.S., December 17, 1903. A Clydesdale mare, six years old, in possession of the present owner about twelve months, and had always been troublesome, both in stable and harness. She was always in œstrum and very vicious, especially with her fore feet. Both ovaries were very cirrhotic. In this case, as in No. 38, on making the incision above the "os," my hand passed into the body of the uterus and I withdrew it and made a fresh incision below. The mare recovered from the operation, and was sent home on January 3rd, and stood in her owner's stable fully a week, after which she was put to work. She worked quietly, but always seemed dull, and not at all her usual self. The owner foolishly commenced by sending her a journey of thirty miles, and, on the following day, a journey of sixteen. That night she did not clear her food up as greedily as usual, although she finished it up the next morning. On this day she was suddenly seized with colic, and, although not in excessive pain, died in about a couple of hours.

Mr. Laird, to whom I am indebted for the above details, made a

post-mortem examination which revealed a certain amount of peritonitis, but no trace of pus or other foreign body.

I suppose that this sequel must be attributed primarily to the operation, but to send the mare, immediately upon re-starting work, a journey of thirty miles, and to follow it up by another of sixteen miles the next day, with a load, must undoubtedly have contributed to the bad result.

Case 41.—June 22, 1904, in conjunction with Mr. E. Coleman, M.R.C.V.S. A cart mare, eight or nine years old, in possession of the present owner for about twelve months, and a vicious kicker in harness, especially when in œstrum, and when the bridge band touched her quarters; of late this condition had been constant. During the 28th a letter from Mr. Coleman stated that the mare seemed to have taken no notice whatever of the operation, and that she was perfectly quiet except that she swished her tail when the groom put his hand along her back. She was sent to work in August and has made a most excellent recovery, still working satisfactorily.

Case 42.—July 4, 1904, in conjunction with Mr. Balls, M.R.C.V.S. The patient, a trap mare, nine or ten years old, had been in possession of the owner for five and a half years. and had been very troublesome for about six months. She was now very vicious even to approach in the stable, and only one man could enter the box to feed her. She was a vicious kicker, very hysterical and dangerous. The ovaries were very cystic and cirrhotic. Recovery was uneventful, and she was sent to work three weeks later, working quite quietly in single and double harness. At the present time she is working satisfactorily.

Case 43.—November 16, 1904, in conjunction with Mr. J. W. Brownless, M.R.C.V.S. A bay van mare, nine or ten years old, which had been in possession of the owner for fifteen months; she had become very troublesome during the past four or five months and was now dangerous to drive, squealing and kicking viciously, especially when put in the van. Both ovaries were enlarged, cystic and cirrhotic. After the operation she was dull for a couple of days, but otherwise recovery was uneventful and she was sent to work within three weeks. She worked very satisfactorily for about a month, but in January, 1905, relapsed into her old habits and was sold and lost sight of.

Case 44.—In conjunction with Mr. C. W. Perryman, F.R.C.V.S., January, 1905. A roan cart mare, 8 years old, which had periodical fits of hysteria, especially at period of œstrum, one being a very severe one in which she became positively dangerous. Both ovaries were enlarged and cirrhotic. The mare went to work three weeks later and has worked satisfactorily ever since.

Case 45, April 24, 1905, in conjunction with Mr. William Pauer. M.R.C.V.S. Polo pony, 14 or 15 years old. She had been in the owner's possession for three years, and was a good pony for her work, but always more or less in œstrum. Lately she had been very bad and quite a nuisance, hugging the other horses and squealing, &c.

May 1, Mr. Pauer wrote: "The mare has done splendidly, and has never looked back; the coachman says, she has given up the habit of swishing her tail round when her flanks are being dressed." She was sent to work in the usual way and has since given every satisfaction. A letter received in November of last year stating: "The mare is entirely cured of her objectionable habits, and has become a better and faster pony in every way."

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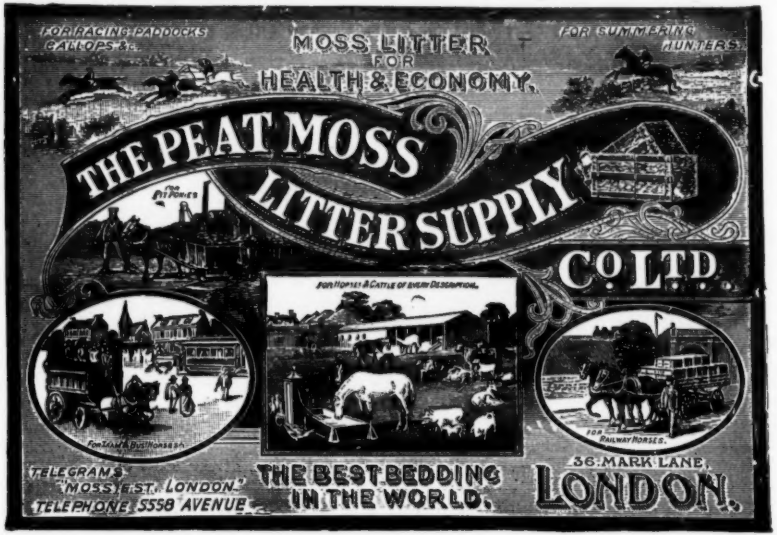
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Case 46.—May 9, 1905, in conjunction with Mr. Golding, M.R.C.V.S. A pony mare, 10 or 12 years old. She had been in possession of the owner for three months, and her history was that she was quiet until some years before, when she was allowed to have a foal; since then she had been exceedingly troublesome and vicious, and was very objectionable in every possible way. Both ovaries are cirrhotic, the right one being larger and the left one smaller than normal. She made an uneventful recovery from operation, but, except for about a week, it did not cause the slightest improvement, and at the present time she is still as troublesome and vicious as ever.

Case 47.—July, 1905, in conjunction with Messrs. J. and P. Simpson, F.R.C.V.S. A cart mare, aged 7 years, vicious and troublesome in the stable, and now kicking and squealing when put in harness. She made an uneventful recovery from the operation and worked satisfactorily for three months. She then had a fresh driver, and for some inexplicable reason immediately started the jib, and since then has become a confirmed jibber. Messrs. Simpson and myself agree that it is doubtful whether this can in any way be attributed as a result of the operation.

Case 48.—November 9, 1905. A polo mare, eight years old. She had been in possession of the owner for six months, and was good at play except when in œstrum. When in this condition she would refuse to do her work, and at times could not even be persuaded to go on the ground, she would squat down and hug the other ponies and kick viciously when spurred or whipped. Both ovaries were cystic, the left one larger than the right. Recovery from the operation was uneventful, and she was sent home (a long railway journey) a fortnight later. Apparently the result has been satisfactory, but she has not yet been played again at polo.

Case 49.—November 11, 1905, in conjunction with Mr. Pollock, F.R.C.V.S. A Hackney mare, 10 years old, has had several foals, the last one being last year. She had been in the owner's possession for seven months. For six months she had been troublesome and vicious. Recovery was uneventful, and she went to work in about three weeks.

Case 50.—November, 1905. Polo mare, 11 years old. She was troublesome at time of œstrum, refusing to play freely, and hugging the other horses. The ovaries were stated by Professor MacFadyean to be cirrhotic. She has made an uneventful recovery, but has not yet been tried at polo.

Summarising the above fifty consecutive cases it will be seen that, under chloroform, anæsthesia and strict antiseptic precaution, the operation of ovariotomy, although not of course free from risks, is one which can be performed with comparatively little fear of death from peritonitis, the great bugbear of old-fashioned surgery. For a major operation it is really astonishing how little constitutional, and even local, apparent disturbance takes place afterwards; and it must be admitted, looking at it from all points of view, that the operation of ovariotomy is well worth consideration before condemning an old favourite, or a previously useful animal, to be shot on account of vicious habits which can be attributed to a diseased condition of the ovaries. Provided the animal is not very old, and, above all, has not acquired the persistent *habit* of kicking or otherwise making herself disagreeable, a glance at the above statistics will convince even the most prejudiced observer that the operation is well worthy of a trial.

TRYPANOSOMIASIS IN CAMELS.*

BY DR. A. THEILER (BACTERIOLOGIST TO THE TRANSVAAL GOVERNMENT).

On December 3, 1904, a herd of thirty-six camels arrived in Pretoria. They were, according to the statement of the proprietor, imported from Somaliland, and had a sea journey of seventeen days behind them, during which time they had been kept in the hold of the ship. Shortly after landing in Lourenço Marques one of the animals died. The cause of death, as well as the poor condition of the animals, was considered to be due to the long sea journey and unsuitable treatment on board. On the day the camels arrived in Pretoria the proprietor invited me to inspect them. One of the camels was lying down and unable to rise, whilst two more had a sickly appearance, and several were in a rather poor and unthrifty condition. The sick animal died the same evening, and the proprietor was good enough to send the carcase to the Laboratory, where on December 4 a *post mortem* was made. It was noted that the carcase was in a poor condition, the flesh and blood having a rather pale colour. A particularly striking lesion was the collection of clear liquid in the heart bag, which was somewhat distended, and of a similar collection of liquid in the peritoneal cavity. There were no other lesions by which we could make a definite diagnosis. The symptoms described, however, indicated that some blood disease was present, the cause of which would probably have to be looked for in a trypanosoma.

Accordingly a dog was inoculated subcutaneously with about 5 c.c. blood from the heart. A microscopical examination proved the absence of parasite, but knowing the character of the disease due to trypanosomes well, the diagnosis was postponed for the development of the disease in the dog, this animal being very susceptible to trypanosomiasis, and accordingly the question of its existence or non-existence in the camels would promptly be solved. On December 7 the morning temperature of the dog was higher than usual, a microscopical examination was at once made and the presence of a trypanosoma was noted. There was no doubt left that the dog contracted the infection through the injection of camel blood and that the camel was suffering from a trypanosomiasis. There was, however, the main question what kind of a trypanosomiasis was the one found in the camel; as from the nature of the trypanosomiasis all precautions against it are dependent. The following diseases are due to a trypanosoma which is inoculable into dogs and found in camels:—

(1) Nagana, or tsetse fly disease, due to *Trypanosoma brucei*, still found in Zululand, but especially in the regions of East and Central Africa.

(2) Surra, due to *Trypanosoma evansi*, especially well known in India, and during the South African War imported into the Island of Mauritius, where it devastated almost all domesticated live stock, especially horses and mules, and to a lesser degree the bovines.

(3) El debab, a disease described by Sedgent in Algeria, not yet identified with either surra or nagana. El debab means fly, which is, however, not identical with the tsetse fly.

(4) Mbori, a camel disease described by Cazalbou, who discovered it in camels in 1903 coming from the Sahara to the Soudan. This name also means a fly.

* Abstract from the *Transvaal Agricultural Journal.*

The latter malady was at that time not yet differentiated from any of those mentioned before, although it was probable that el debab and mbori are probably one and the same. Since then a communication from Valle and Panisset of Paris, to the Academies des Sciences, demonstrated that mbori and surra are the same disease. Animals which were immunised against the former did not contract the infection when injected with blood of an animal suffering from the latter. In our case it had to be proved whether the disease in question was surra or nagana. It must be remembered that the differentiation of the two parasites is microscopically almost impossible, there being no definite marks which would under all circumstances indicate which is which. Then, again, it must not be forgotten that such a great authority as Koch considers both diseases as identical, and admits only a variation of virulency of the various strains of the infection. All these points had to be taken into consideration, but especially the fact that the Island of Mauritius introduced surra by the importation of Indian cattle, its stock became decimated by the disease, and, further, knowing that Indian camels were, during the Somali War, imported into Somaliland, they probably also introduced the disease there. I found it, therefore, advisable to consider the trypanosomiasis in the imported camels as the most dangerous one, and accordingly recommended the sequestration on to a place where no mixing with stock of any description was possible. This was promptly done and the camels were kept under close supervision. On December 4 a second camel was found down and unable to rise. It was tapped and the blood injected into a dog, which, however, only after some weeks developed the disease. On December 15 another camel was found dead; a *post mortem* was made and the symptoms as before described were present. A dog was injected with blood taken from the heart, and the trypanosomiasis appeared in the dog on December 20, 1904. On December 17 camel No. 4 was found dead, and again lesions identical with those found in the other camels were present. Also this time a dog was injected in whose blood the trypanosoma developed.

The mortality amongst the camels continued, and by December 24 their number was reduced to twenty-nine animals. The blood of the dead camels never showed trypanosomata and yet it remained infective for dogs, a phenomenon frequently met with in trypanosomiasis; therefore a microscopical examination of the blood of the surviving animals would not have allowed us to separate with certainty the infected camels from the non-infected ones. On the other hand the dog, being susceptible to the disease and showing the trypanosomata in rather large numbers, could be utilised to trace the infected animals.

Accordingly, on December 24, all the camels were tapped and a dog corresponding to the number of the camel was injected with blood. All precautions were taken to prevent any mistake, and all the syringes and needles used for the inoculation were boiled before the tapping of the camels was performed. The dog's temperature was taken daily, and as soon as a rise was noticeable a microscopical examination of the blood was made. Twenty-one dogs were found to be infected with trypanosoma, which, with the exception of a few which were kept for further observation, were destroyed on January 7,

1905. The herd of camels was now separated into two lots, the infected and the non-infected ones, in which latter lot only eight animals remained. It was now thought advisable to test the remaining few again in order to be safeguarded against any possibilities of a latent infection not detected in the first instance. Accordingly the camels were again tapped on January 27, 1905, and a dog, with the corresponding number, was injected with 20 c.c. blood. It was now observed in two cases that the dog which was injected in the first instance on December 24, and which did not show trypanosomata after that injection, showed them after the second injection. In three other cases the dog who had the first injection died without showing trypanosomiasis, whilst they were found in the dog of the second injection. There thus remained out of the eight animals only two which in the second test did not prove to be infected. The camels went down in condition considerably, and some of them had already died. It was considered advisable to kill the infected ones after the first test had been made, and this was carried out. When the second test showed that it was possible that the infection of some of the camels could not be detected even by an injection of blood into dogs, then it was thought advisable, in order to be absolutely on the safe side, to kill the remaining apparently non-infected camels. This was promptly carried out.

As above-mentioned in this stamping-out policy, we looked at the disease as being surra, although there was only circumstantial evidence to point to this diagnosis. It was, therefore, essential for our guidance in the future to give more attention to this disease, and especially to compare it with the facts known about nagana. For this purpose a stable was made absolutely insect proof in which all infected experimental animals were kept. Various species of animals were injected with the blood of a dog, viz., horse, mule, donkey, ox, sheep, goat, rabbit, and rat. The tabulated form will show the difference in the duration of the disease as shown in nagana and the camel disease:—

	Nagana.			Camel Disease.		
	Short.	Long.	Average.	Short.	Long.	Average.
Horse ...	9 days	18	13½	Died on 66th day.		
Mule ...	52 ,,	53	52½	Still alive on 100th day.		
Donkey ...	—	—	—	,,	,,	100th day.
Ox ...	—	—	—	,,	,,	100th day.
Goat ...	30 days	30	30	,,	,,	100th day.
Sheep ...	26 ,,	48	37	,,	,,	100th day.
Rabbit ...	25 ,,	35	30	Died on 108th day.		
Rat ...	—	—	9	Died on 30th day.		
Dogs ...	9 days	34	21½	12	90	51

A comparison of these figures with those given in Laveran and Mesnil's book on trypanosomiasis in the camel disease called mbori demonstrates a striking similarity; according to the above-mentioned scientists inoculated horses lived respectively 136 days or were still alive on the 144th and 184th days. The goat was alive on the 97th day, a sheep's blood was still infective 70 days after being inoculated. Dogs died respectively 30, 48, 56, 65, and 75 days after the inoculation. One rabbit died 51 days after inoculation, and a second one was still alive after two months. The figures given on nagana are

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"Dr. J. Augustus Voelcker, M.A., B.C., Consulting Chemist to the Royal Agricultural Society of England, in his report on the Woburn Feeding Experiments with molasses, 1900-1901, to the Royal Agricultural Society of England, vol. lxii., p. 301, also states:—

"'There is, however, with its use (the use of Molasses), **a tendency to looseness in the animals,** which must be checked by not giving it in too great a quantity. One pound per day of Molasses among four bullocks was found to be about the limit.'"

"Sugar (molasses or molassed) foods **have the detrimental properties of molasses** in proportion to their contents of sugar."

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"In the form of Molassine Meal the humic product enters into combination with these salts, **neutralising them and rendering them inert, so that the danger of feeding on large quantities of crude molasses or sugar is avoided.**"

"It seems at once to fatten and harden the animal."

"There is little doubt that in a short space of time it will become, in spite of prejudice, the staple food of all classes of horses."

"The process of manufacture is a patent and requires special machinery."

"As a therapeutic agent **Molassine Meal undoubtedly has a healthy action on the bowels, aiding digestion** and keeping the patient free from worms."

"The humic acid counteracts the ill effects of the potash salts, and **this danger is avoided in the combination called Molassine Meal.**"

"I have found, on high authority, that it (Molassine Meal) is a great tonic and strengthener, **enabling animals to do the heaviest kind** of work and maintaining them in good condition, **replacing equal quantities of oats, beans, maize, &c.** It is an appetiser, and aids in the easy digestion of other foods. It is, itself, easily digested, and **renders a horse thoroughly 'fit.'**"

"In addition to its hygienic properties, which have been described, **it increases the secretion of milk,** also it regulates the digestive functions."

"Allows damaged forage being used up that otherwise would not be eaten."

"The fæces of animals fed on Molassine Meal are nearly odourless as compared with those of others that are getting ordinary food. **In pigs this is most evident, and is of considerable importance** when these animals are kept in towns or villages."

Extracts from an article in the "Veterinary Journal," May, 1905, by Colonel J. A. NUNN, F.R.C.V.S., F.R.S.E., D.S.O., C.I.E., Army Veterinary Department.

[SEE NEXT PAGE.

The Wonderful Merits of

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Mr. JUSTICE WARRINGTON, in giving JUDGMENT, said:—

"It was found that **molasses as a food for cattle could not be used safely,** though it had some very good effects, because of the existence in it of potash salts, which had a deleterious effect on the stomachs of the animals. The inventor said he got over the difficulty by using molasses in combination with peat, by which means he partially got rid of the salts, or converted them into non-deleterious substances. In his opinion, having heard the chemical evidence for this Company, the owners of the patent, he was satisfied that the statement in the specification that the **peat had a chemical effect on the molasses, which prevented it from being so deleterious,** was true.

As most of the imitation Sugar Foods are named to begin with "MOL," it is important that buyers should see that they are having MOLASSINE MEAL, otherwise they suffer loss through bad results in feeding and financial loss themselves.

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"Then he had the further evidence of Prof. McLauchlan Young, F.R.C.V.S., F.R.S.E., F.R.P.S., F.Z.S., who had made some experiments—not for the purposes of this trial—with various animals in Scotland during last year, and the result of those experiments is, that the food so compounded . . . **is very valuable as a nutritious food."**

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those which I experienced in experiments made in the years 1897-99 with a South African strain of virus coming from Zululand. We must in the face of these experiments identify our camel disease with mbori, and thus with surra.

The appearance and the disappearance of the trypanosomata in the blood differs in the various species of animals, and even in one and the same animal, and there is much variation in their number. From the length of time animals can live with trypanosomata in their blood it follows, as shown above, that the disease is of a very chronic character. It shows very few symptoms which would permit of a certain diagnosis.

The incubation time in dogs was noticed to be as short as three days, when the temperature had risen and the parasites appeared; the elevation of temperature kept on for a few days, to drop again. This phenomenon repeated itself several times, so that the temperature curve shows exacerbations and remissions, which become typical for a trypanosomiasis. The parasites were most frequent during the exacerbations and less or absent during the remissions. Some of the dogs whose temperature showed the typical reaction had nevertheless no parasites in the blood, whilst in others the trypanosoma only appeared after a long time, in one instance on the 72nd day, and in another it was only noticed after 74 days after injection. These observations have to be taken into consideration when using the dog as a means to diagnose the disease. Towards the end of the disease the temperature curve becomes irregular, dropping either completely to sub-normal or rising very high in the evening and dropping in the morning. There are but few symptoms present during life. Notwithstanding a good appetite the animal becomes poorer and poorer, is reduced to a skeleton, and is unable to rise. In some of the dogs a dark greenish diarrhœa was noticed during the disease. Some of the dogs had the symptoms of a purulent conjunctivitis and diffuse keratitis.

On *post-mortem* the most constant lesion found was a general anæmia and tumour of the spleen, reaching from three to four times its normal volume, with softened pulpa. Occasionally jaundice, accompanied with a hyperæmic liver and a full bile bag, were noticed. The blood usually showed *ante-mortem* clots. The rise in temperature of the horse, mule, and donkey began respectively on the 5th, 8th and 17th day. The temperature curve of these animals showed, at the beginning of the disease, exacerbations and remissions similar to those noticed in the dog. The trypanosomata were most frequently met with during a rise of the temperature, and would absolutely disappear for several days. A complete disappearance of the parasites might take place within twenty-four hours to reappear almost suddenly. Except a continual loss of condition, which was especially marked in the horse, no other symptoms were noticed. The *post mortem* of the horse revealed no typical lesions. Anæmia was marked by the excessive paleness of the serous and mucous membranes, there was some liquid in the heart bag, and the sulci transversales and longitudinales were infiltrated with yellow liquid, and gave that part of the heart a jelly-like aspect. The sheep, goat, and ox showed the peculiarity that, in every instance when their blood was examined the trypanosomata were absent. Yet, from the temper-

ature chart it had to be expected that at least sheep and goats were infected as irregular exacerbations were noticeable, whereas the ox never showed any fever reaction at all. To test whether these animals were infected with trypanosoma, about the fifth week after the injection with virulent blood they were tapped and the blood injected into dogs, with the result that the trypanosomata made their appearance. It is a further remarkable fact that during the hundred days of trypanosomiasis the bull lost nothing in condition, and there was no noticeable change in that of the sheep and the goat.

The rabbits, towards the end of the disease, showed, besides excessive anæmia, a blepharo-conjunctivitis, which in one case was very marked. The trypanosomata were but rarely met with in the blood. In the blood of rats the parasites were very numerous at the end of the disease.

With the exception of one trypanosomiasis, the dourine, all the others are communicated by means of flies. With regard to the names mbori and el debab, just as tsetse indicates a fly, mbori indicates a tabanus. It was, therefore, interesting to see whether our common bloodsucking flies, such as hippoboscol and stomoxys, would transfer the disease. For this purpose a series of trials was undertaken. First, the flies were fed on the infected horse or donkey and then, in turn, after intervals of twelve to one hours, on donkeys. These experiments were carried out almost daily during three weeks, but in no instance was the disease transmitted by these flies.

I am not prepared to draw any conclusions from these negative results. It is possible that a certain species of fly is required to transmit the infection, and before we know what that species is and whether such species exists in this Colony, all trypanosomiasis imported from abroad should be dealt with under the Contagious Diseases (Animals) Act.

Reviews.

THE JOURNAL OF TROPICAL VETERINARY SCIENCE. Published by Thacker Spink & Co., Calcutta. Subscription 17s. 6d. per annum.

THE first volume of this new Journal, which is intended to deal with a most important subject, viz., the diseases of animals in tropical countries—has now been printed under the editorship of Major Pease, Captain Baldrey, and Mr. R. E. Montgomery, all of whom are at the present time stationed in India.

It is a journal which will fill a much felt want, and it is conducted with a similar object as that which originated in the mind of the late Professor Steel when he instituted the *Quarterly Journal of Veterinary Science* in India. Since his day veterinary scientific knowledge has made enormous strides, and the origins of many diseases which were unknown then have been demonstrated. All are of vast importance,

not only to animals but also to those engaged in working out the pathology and bacteriology of the diseases of man.

For those whose lives are spent in tropical countries the Journal will be indispensable. The first number contains articles on the following subjects: "A New Species of Trypanosoma found in the blood of rats, together with a New Metrical Method of Standardising the Measurements of Trypanosomata," by Professor Lingard, M.B. D.P.H. "Observations on Bilharziosis amongst Animals in India," by R. E. Montgomery, M.R.C.V.S., I.C.V.D. "Some Observations on Normal and Rinderpest Blood," by Captain Baldrey, F.R.C.V.S., I.C.V.D. "Tibarsa Surra (Trypanosomiasis in the Camel)," by Major Pease, M.R.C.V.S., F.Z.S.;" and another article by Professor Lingard on the "Transmission of Trypanosoma Evansi."

The Journal is brought to a close by a few pages of notes, extracts and reviews, and the plates and general style leave nothing to be desired.

TEXAS FEVER, WITH METHODS FOR ITS PREVENTION. By JOHN MOHLER, V.M.D. Published by the Bureau of Animal Industry, U.S.A.

THE little manual describes very clearly in some fifty pages, amongst which are interspersed a number of life-sized and naturally-coloured illustrations of the various ticks which infest cattle, the methods which are to be taken for the prevention of Texas fever. Chapters are given on the cause of the disease, the method of infection, the various harmful and harmless ticks, and other details of importance to those who live in countries where tick fever is met with. In fact, every aspect of importance is fully dealt with and the whole brochure is full of useful up-to-date information.

INDEX CATALOGUE OF MEDICAL AND VETERINARY ZOOLOGY, Parts 12 and 13. By C. W. STILES, Ph.D., and ALBERT HASSAL, M.R.C.V.S. Published by the United States Department of Agriculture.

THIS Index Catalogue, which is published from time to time by the Bureau of Animal Industry of the United States Department of Agriculture, fills a very useful purpose in that by reference to its pages the title of the articles and words written by authors of every country are tabulated, and can be traced up at once without an infinity of labour. This index catalogue is a boon to all workers in Medical or Veterinary Zoology.

THE SYNONYMY OF TÆNIA. By CH. WARDEL STILES, Ph.D., and EARLE C. STEVENSON, M.A. Published by the United States Department of Agriculture.

THIS small brochure tabulates the various names under which the numerous tænia are known, or have been known, and has been written with a view to establish the current specific names for each species.

Personal.

PROFESSOR SIR JOHN MCFADYEAN was one of those who attended at the levée held by His Majesty the King at Buckingham Palace on February 27.

AT the January meeting of the Court of the Worshipful Company of Farriers, "in recognition of services rendered, and of the great interest taken by him in the Registration of Farriers," Mr. W. Jones Anstey was made an Honorary Freeman and Liveryman of the Company, and thus of the City of London. Mr. Anstey is well known to many members of the Veterinary profession as a judge in farriery competitions at agricultural and other shows, and as a lecturer on all subjects pertaining to the blacksmith's art in many parts of England. At the Manchester Technical School he has held the appointment for upwards of thirteen years, and he is the official lecturer on Farriery to the University of Leeds. Probably no one is better known or liked amongst the farriers themselves; certainly no one has done more to raise the standard and increase the knowledge of the workmen; and Mr. Anstey is especially popular because his classes recognise that he can not only instruct them theoretically but, when occasion arises, he is able to give them practical demonstrations.

MR. JOHN WILKINSON TAYLOR, M.P., who was recently elected to Parliament as the Labour representative for Durham, is a blacksmith by trade. He owes his advance in life mainly to his own energies, and to the support of the Mechanics' Union, of which he is now the moving spirit. A popular man in his own district, he is a member of the Durham County Council and many other influential bodies.

ON the authority of the New Zealand Correspondent of *The Creamery Journal*, we are pleased to publish the following extract:— "Mr. Gilruth, Chief Government Vet., has withdrawn his resignation. Though he did not secure full home-rule for his division, as against the overlordship of the Department of Agriculture, he is understood to have received some substantial concession on those lines. All's well that ends well. The New Zealand Agriculturist interest could have ill-afforded to lose Mr. Gilruth's services."

MR. H. A. BARRETT, M.R.C.V.S., of Nuneaton, met with a rather nasty accident in the hunting-field, his horse falling back on him and fracturing his thigh. Fortunately, a doctor happened to be close at hand; first-aid was at once rendered, and up to the present matters are progressing as satifactorily as can be expected.

UNIVERSITY OF LONDON.

Board of Studies in Veterinary Science.

A Board of Studies in Veterinary Science has been formed. It is, in the first instance, constituted as follows:—

(*a*) *Teachers of the University.*—Professor W. B. Bottomley, King's College and Royal Veterinary College; Professor J. R. Bradford, University College; Professor T. E. Brodie, London School of Medicine for Women, Brown Animal Sanitary Institution, and Royal Veterinary College; Mr. T. W. Cave, F.R.C.V.S., South-Eastern Agricultural College; Professor M. J. R. Dunstan, South-Eastern Agricultural College; Professor Sir John McFadyean, M.B., B.Sc., M.R.C.V.S., Royal Veterinary College; Professor E. S. Shaw, M.R.C.S., L.R.C.P., F.R.C.V.S., Royal Veterinary College; Professor H. W. M. Tims, Charing Cross Hospital and Bedford College; the Professor of Protozology (when appointed).

(*b*) *Other Persons.*—Dr. C. J. Martin.

Preliminary Examinations in Veterinary Science for External Students, January, 1906.

Examiners.—*Chemistry*—Professor W. H. Perkins, Ph.D., F.R.S.; and Alexander Scott, Esq., M.A., D.Sc., F.R.S.

Experimental Physics.—Professor F. T. Tronton, M.A., D.Sc., F.R.S.; and W. C. D. Whetham, Esq., M.A., F.R.S.

Pass List.—401, Richardson, Ulick Forster, Royal Veterinary College.—*London University Gazette.*

A NEW VETERINARY PERIODICAL.

A new Veterinary paper has made its appearance under the heading of *The Veterinary Student*, or rather, perhaps, we should say an old one has been resuscitated. A similar paper was started some five years ago, but, for want of energy, or perhaps other causes, was allowed to lapse into oblivion. That there is room for it no one will deny, and the first number gives evidence of great promise, although we think it should be made of a more intercollegiate character, and that contributions to its columns should be sent, not only from the London College students, but from each of the other schools.

The advertisement Editor has done his part exceptionally well, and, as this always forms one of the business portions of a paper upon which its existence depends, the financial success is evidently secured; in fact, the bantling paper might, in this respect, even give a lesson to some of its elders, for this department has no less than two dozen contributors. Even the clinical column is well filled, and, indeed, under no heading has there been need for padding or superfluous matter.

As Editors of the oldest existing veterinary paper we welcome the advent of this, the youngest, and trust that it may have a most successful run.

The Veterinary Student is edited by a committee of students, and is printed by Messrs. Gillingham & Co., 257, Kentish Town Road, N.W., the price being only 6d. a copy, or, in advance, 1s. 9d., post free, for the three copies. Probably many old graduates will send in their names as subscribers.

Translations and Extracts.

THE MODE OF PRODUCTION OF SILKWORM GUT.

An interesting account of the history and mode of production of silkworm gut has been published by M. J. Triollett in the *Bulletin des Sciences Pharmacologiques* (1905, No. 5). It is obtained from the silk-producing glands of Bombyx mori at the time when the larva commences to spin. It has been known from very early times, but was used for fishing purposes only until 1865, when Dr. Passavant, of Frankfort-on-Main, employed it in surgery. His example was later followed in this country by Mr. T. Bryant and Dr. Granville Bantock. Mr. Bryant, in the edition of his "Surgery" published in 1874, mentioned his experiences in the use of this ligature, and recommended it for "quill sutures." Dr. Bantock employed the gut at first as a ligature for arteries, and then as a suture. Silkworm gut is tenacious, flexible, and easy to tie in a surgeon's knot, and does not cut the tissues as is the case with metallic threads. Owing to its smooth surface it can readily be sterilised and removed from the patient without causing undue pain. It is rarely employed, however, as a buried ligature, being almost exclusively used as a suture owing to the impossibility of making with it so tight a knot as with silk or catgut. Although Italy produces large quantities of silkworm gut for fishing, the surgical thread comes chiefly from the province of Murcia in Spain. The manufacturers supply the peasants with boxes containing an ounce of the eggs, sufficient to produce about 40,000 silkworms. These are hatched during April and May when the mulberry leaves begin to appear. The incubation occupies seven days at a temperature of from 22° to 30° C. The silkworms are microscopical at first and attain their full size in twenty-four days, moulting four times in succession. The longest and most vigorous are then set apart and carefu ly watched. When they manifest signs of beginning to spin they are killed by plunging them in a large tub of water acidulated with vinegar or citric acid, in which they remain from twelve to fifteen hours. The dead silkworms are then taken one by one by women, who make a longitudinal incision along the back, and carefully withdraw the intestine, stomach, œsophagus, and probably the greater part of the muscular and vascular tissue. They then isolate the two silk-producing glands and wash them with hot water. The glands are then manipulated by women specially skilled in the work who hold each gland by its ends and draw it out so as to produce one thread, which is placed on a polished marble or granite table. In contact with air the thread rapidly dries and acquires a more or less blood-red yellow colour. This crude silkworm gut is then sold to the manufacturer and further treated. It is first boiled in alkaline water to remove fat and blood, and is then dried in the sun, being protected from dust. It is next polished by means of slightly oiled pumice stone with an apparatus, the secret of which is jealously guarded. The gut is then bleached with sulphurous acid and rubbed vigorously with chamois leather to remove dust and sulphur. The threads are finally sorted according to their thickness into five grades, varying from a tenth to half a millimetre in thickness. These five grades are known re-

spectively as "very fine," "fine," "medium," "thick," and "extra thick." The two extreme sizes are rarely used. The fine threads should resist a mean pull of 2·5 kilogrammes, the medium threads 4 kilogrammes, and the thick threads 6 kilogrammes. A length of from 30 to 32 centimetres is suitable for surgical use. The gut is coloured by soaking for an hour or two in a solution of fuchsine or methylene blue, and subsequently by washing thoroughly to remove excess of dye. In order to render it supple it is immersed for about six weeks in an antiseptic solution, usually a solution of phenol containing a little glycerine. Finally, the gut is sterilised in closed flasks containing an antiseptic solution in an autoclave at a temperature of 120° C. for half an hour. Silkworm gut so prepared varies much in quality, according to the thoroughness of the treatment to which it has been subjected. It loses its firmness on keeping. The annual production of silkworm gut in Spain is about 150,000,000 threads, the preparation of which provides employment for from 4,000 to 5,000 persons; the total value amounts to from 2,000,000 to 3,000,000 francs.

(*The Lancet.*)

HYSTEROPRAXY IN THE TREATMENT OF INVERSION OF THE VAGINA IN SMALL ANIMALS.

BY MATHIS.

THE operation of hysteropraxy consists in fixing the uterus to the abdominal wall to prevent the vagina being everted. It is indicated in chronic cases in which reduction is possible, but if this condition is irreducible amputation is indicated.

Castration should be performed at the same time to prevent œstrum. This causes progressive atrophy of the generative organs and prevents accidents in parturition owing to the fixed uterus not being able to accommodate itself.

The usual antiseptic precautions are taken and the incision, 3 to 4 c.c. in length, is made along the linea alba, in front of the pubis. The ovaries are then removed and the horns of the uterus pulled forward to retract the vagina. The horns of the uterus are fixed to the abdominal wall 1 to 2 c.c. from the edge of the incision and the wound sutured up in the usual fashion.

The author describes four operations which he has performed.

CASE 1.—In a six months' old pig suffering from chronic prolapse of the vagina, but which was reducible. Sutures were placed across the lips of the vulva, but the operation was a failure. Hysteropraxy was performed in the usual manner. There was a slight discharge from the vulva for a few days, with œdema of the lower portion of the abdomen, but these soon disappeared. A large hernia formed at the site of the operation but in spite of this complication the animal fattened and eventually made a good carcase.

CASE 2.—A bitch which had suffered from prolapse of the vagina for a month. The lips of the vulva were sutured after reduction, but the

operation was not successful. Laparotomy was performed; the horns of the uterus were sutured to the abdominal walls and the ovaries removed, but the prolapsed part was so indurated and thickened that it was impossible to reduce it entirely. An elastic band was put round the irreducible part, which sloughed off; the case did well and the animal was discharged cured.

Case 3.—Bitch which for six months had suffered from partial inversion of the floor of the vagina and was operated upon as in case 2. The operation appeared to be successful, and all that remained was a slight thickening of the floor of the vagina.

Case 4.—Similar to case 3. The catgut sutures, however, were too fine and cut out on the second day, when a fresh inversion took place but in a lesser degree. The animal was a bad patient, tearing off the dressings and scratching the wound, so that an abdominal hernia formed; eventually, however, she recovered and was discharged cured.

Société des Sciences Vétérinaires de Lyons.

Letters and Communications, &c.

Prof. Taylor; Mr. H. B. Eve; Mr. A. S. Hodgkins; Prof. Dunstan; Messrs. Parke, Davis & Co.; Mr. Pottie; Royal Sanitary Institute; Mr. Guy Sutton; Mr. T. F. Prime; Mr. Elphick; Capt. Lane; Colonel Nunn; Mr. R. Lewis Green; Mr. Turtill; Prof. Bradley; Mr. Linton.

Books and Periodicals, &c., Received.

The Veterinary News; Journal of Tropical Veterinary Science; Our Cats and the Fur Fancy; The Illustrated Kennel News; Irish Farming World; Report of the Board of Agriculture; Department of Agriculture (Ireland); Receuil de Médecine Vétérinaire; American Veterinary Review; The Medical Press; The Breeding Industry (Walter Harper, M.A.); Index Catalogue of Medical and Veterinary Zoology (Stiles & Hassall); Royal Society for the Prevention of Cruelty to Animals (Report on Humane Slaughtering); Waterford Evening Mews; Western Veterinarian.

Note.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

Letters for the Journal, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements), should be addressed to the Editor.

Manuscript—preferably type-written—should be on one side only of paper, marked with full name of author.

Illustrations for reproduction should be in good black or dark brown on white paper or card.

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